

STUDENT BOOK

SUCCESS **OAS**
with

Math 8

**Ensuring Student Success
with
Oklahoma Academic Standards**

Written by Oklahoma Teachers for Oklahoma Teachers

Donna Cook



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SUCCESS *with* OAS

Math 8 by Donna Cook

Donna Cook received her B.A in Math Education in 2000, and her master's degree in 2013 from Cameron University. She currently sits on the Board of Directors for the Oklahoma Council of Teachers of Mathematics. Ms. Cook was a nominee for the Presidential Award of Excellence in Math and Science Teaching in 2015, and Public School Teacher of the Year for 2016.

Melody Atteberry

*B.A. Special Education, M.A. Educational Administration
University of Oklahoma*

Executive Editor

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President

Consultant

Alpha Plus Math Success with OAS Team

Oklahoma Academic Standards Alignment Editors / Contributing Authors: Laura Pierce & Sandra Valentine

Editorial & Publishing Assistance: Toni Blewett, Jerry Plant, Wendy Pratt

Publisher: Jan Barrick, Chief Executive Officer, Alpha Plus Systems, Inc.



ALPHA PLUS
Educational Systems

3315 NW 63rd Street, Oklahoma City, OK 73116

(405) 842-8408

www.alphaplus.org

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PA.N.1.1 Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions.

Real-World Connections

In the real world, why would you need to know exponents? Often times, a coach may need to notify his players that a game is being cancelled, postponed, or moved, but if the team was large that could be very time consuming for one person. The coach instead could send a text to the three team captains. This means, after one round of texts 3^1 , three players have been notified. These three captains each text three more players. Therefore, during the second round of texts 3^2 , nine more players are texted for a total of 12. This would continue with each player texting three players. To determine how many were texted in one round, you would use 3 as the base number and the round of texts as the exponent. To get the total texted, you add the value from each round.

Vocabulary

exponent	the number or variable that indicates how many times the base is used as a factor, e.g., in $4^3 = 4 \times 4 \times 4 = 64$, the exponent 3 shows that 4 is repeated as a factor three times
base	the number or variable representing the factor being multiplied
expression	a mathematical phrase that combines operations, numbers, and/or variables
equivalent numerical expressions	two numerical expressions are equivalent if one can be obtained from the other using the properties of operations, as well as by representing numbers in the expressions in different but equivalent forms
equivalent algebraic expressions	two algebraic expressions are equivalent if one can be obtained from the other using the properties of operations, as well as by representing numbers in the expressions in different but equivalent forms

Guided Practice (PA.N.1.1)

Name _____

Given a number in exponential form, a base and exponent, a numerical or algebraic expression, or a base and total value, calculate the missing parts.

	Exponential Form	Base	Exponent	Numerical/Algebraic Expression	Value
1.	4^5				
2.		3	6		

Write the multiplication or division problem to one power and solve.

3. $5^3 \cdot 5^5 \cdot 5^2 =$ _____

4. $3^2 \cdot 2^4 \cdot 3^3 \cdot 2^3 \cdot 3^2 \cdot 2^2 =$ _____

5. $\frac{5^6}{5^2} =$ _____

6. $\frac{2^5 \cdot 3^6}{3^4 \cdot 2^2} =$ _____

7. $\frac{4^2 \cdot 3^3 \cdot 4^3 \cdot 3^2}{3^2 \cdot 4^2 \cdot 4 \cdot 3^4} =$ _____

8. $\frac{2^3 \cdot 2^5}{2^6 \cdot 2^2} =$ _____

9. $(2^4 3^2)^2 =$ _____

Solve.

10. If Richard bought two boxes of batteries at Sam's and each box had 4 packages continuing 4 rows of 4 batteries each, how many batteries did Richard buy?

PA.N.1.1 Develop and apply the properties of integer exponents, including $a^0 = 1$ (with $a \neq 0$), to generate equivalent numerical and algebraic expressions.

Write the numerical or algebraic expression as an exponential number.

Example: $5 \times 5 \times 5 \times 5 = 5^4$

1. $3 \times 3 \times 3 \times 3 \times 3 =$ _____

2. $m \times m \times m \times m \times m \times m =$ _____

Write each exponential number as a numerical or algebraic expression.

Example: $d^3 = d \times d \times d$

3. $6^4 =$ _____

4. $b^6 =$ _____

Identify the base and exponent of the exponential number.

Example: 3^4 ; base = **3** exponent = **4**

5. 2^3 ; base = _____ exponent = _____

6. 5^7 ; base = _____ exponent = _____

Calculate the value of the exponential number.

Example: $2^4 = 16$

7. $3^4 =$ _____

8. $5^3 =$ _____

Independent Practice (PA.N.1.1)

Name _____

*Write the multiplication or division problem to one power and solve.***Example:** $3^5 \cdot 3^2 = 3^7 = \underline{2,187}$

9. $2^5 \cdot 2^4 \cdot 2^2 =$ _____

10. $3^3 \cdot 3^4 \cdot 3^2 =$ _____

11. $4^2 \cdot 2^4 \cdot 4 \cdot 2^3 \cdot 4^3 \cdot 2^2 =$ _____

12. $m^5 \cdot 3^2 \cdot m \cdot 3^4 \cdot m^3 \cdot 3^3 =$ _____

13. $\frac{4^6}{4^2} =$ _____

14. $\frac{6^7}{6^5} =$ _____

15. $\frac{3^6 \cdot 4^6}{4^4 \cdot 3^3} =$ _____

16. $\frac{4^5 \cdot 2^7}{2^4 \cdot 4^3} =$ _____

17. $\frac{3^4 \cdot 2^3 \cdot 3^7 \cdot 2^2}{2^2 \cdot 3^2 \cdot 2^5 \cdot 3^6} =$ _____

18. $\frac{4^5 \cdot 4^2}{4^4 \cdot 4^3} =$ _____

19. $(4^2 n^3)^3 =$ _____

Solve.

20. Nicki shows a magic trick to three of her friends. Each of these friends show it to three more friends. If this pattern is repeated two more times, how many people now know the trick?

Complete the table below.

	Exponential Form	Base	Exponent	Numerical/Algebraic Expression	Value
1.	6^3				
2.		3	4		

Write the multiplication or division problem to one power and solve.

3. $\frac{3^2 \cdot 4^6 \cdot 3^5 \cdot 4^3}{4^2 \cdot 3^3 \cdot 4^4 \cdot 3^2} = \underline{\hspace{2cm}}$ 4. $\frac{3^5 \cdot 2^2 \cdot 3^7 \cdot 2^3}{2^4 \cdot 3^4 \cdot 2^3 \cdot 3^4} = \underline{\hspace{2cm}}$ 5. $(4^2)^3 = \underline{\hspace{2cm}}$

6. $5(4) = \underline{\hspace{2cm}}$ 7. $-3(5) = \underline{\hspace{2cm}}$ 8. $15 \div (-3) = \underline{\hspace{2cm}}$

9. $-27 \div 9 = \underline{\hspace{2cm}}$

10. Charley had \$100 on the first of the month. He made three deposits of \$135, \$340, and \$175. He had five debits in the amounts of \$310, \$135, \$115, \$130, and \$50. What was his new balance at the end of the month?

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PA.N.1.2 Express and compare approximations of very large and very small numbers using scientific notation.**Real-World Connections**

As scientists continue to do research with today's technology, the use of very large and very small numbers will increase. A large number that a scientist may use is the distance from Earth to the sun, which is about 93,000,000 miles. A small number that a scientist might use is the weight of a dust particle, which is 0.000000000753 kilograms. These factors may seem impossible to imagine since the magnitude of both values is very significant. Since scientists publish data that other scientists around the world will need to read, they must be accurate. However, writing out these long numbers numerous times may take more time than scientists want to spend. Therefore, they write these numbers in a short hand version called scientific notation.

Vocabulary

standard notation	the normal way of writing numbers
approximation	to estimate a number, amount or total, often rounding it off to the nearest 10 or 100
scientific notation	a widely used floating point system in which numbers are expressed as products consisting of a number between 1 and 10 multiplied by an appropriate power of 10

Rewrite each number from standard notation to scientific notation.

1. 3,500,000,000

2. 206,000,000,000,000,000

3. 0.000024

4. 0.000000000804

Rewrite each number from scientific notation to standard notation.

5. 2.13×10^6

6. 3.002×10^{11}

7. 3.104×10^{-7}

8. 1.035×10^{-9}

Guided Practice (PA.N.1.2)

Name _____

Rewrite each number from a calculator display to standard notation.

9. $2.4 \text{ E } 4$

10. $2.006 \text{ E } - 12$

PA.N.1.2 Express and compare approximations of very large and very small numbers using scientific notation.

Rewrite each number from standard notation to scientific notation.

1. 20,300,000

2. 0.00000014

3. 180,000,000,000

4. 0.00000000106

5. 30,010,000,000,000,000

6. 0.0000000201

Rewrite each number from scientific notation to standard notation.

7. 4.06×10^6

8. 1.3×10^{-7}

9. 2.015×10^{-3}

10. 2.00216×10^4

11. 6.0176×10^{13}

12. 1.001051×10^{-2}

Rewrite each number from a calculator display to standard notation.

13. 18.04 E 5

14. 146.0 E -3

Independent Practice (PA.N.1.2)

Name _____

15. 3.0012 E 8

16. 2.03 E -5

Rewrite each number from standard notation to how it might display on a calculator.

17. 21,001,000,000,000,000

18. 0.00000005106

Solve.

19. The earth is 150,000,000 kilometers from the sun. What is the distance from earth to the sun in scientific notation?

20. The length of a red blood cell written in scientific notation is 8.0×10^{-6} . What is the length of a red blood cell in standard notation?

Rewrite each number from standard notation to scientific notation.

1. 18,200,000,000

Rewrite each number from scientific notation to standard notation.

2. 1.6×10^{-4}

Rewrite the number from a calculator display to standard notation.

3. 15.4 E -4

Rewrite the number from standard notation to how it might display on a calculator.

4. 20,003,000,000,000,000,000

Complete the table below.

	Exponential Form	Base	Exponent	Numerical/Algebraic Expression	Value
5.	4^5				

Write the multiplication or division problem to one power and solve.

6. $\frac{9^6 \cdot 9^2}{9^5 \cdot 9^3} =$ _____

7. $(3^2 2^4)^3 =$ _____

Complete the table below.

	Fraction	Decimal	Percent
8.	$\frac{2}{5}$		
9.		0.15	

Solve.

10. Mrs. Hall's classes went on a field trip. She noted that she had the following ratios:

$$\frac{26 \text{ girls}}{21 \text{ boys}}; \frac{16 \text{ 6th graders}}{17 \text{ 8th graders}}$$

Based on this information, how many 7th graders were on the trip?

PA.N.1.3 Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation.

Real-World Connections

When calculating how much time it takes to cover a specific distance at a constant rate you use the equation $\frac{D}{R} = T$, which is distance traveled divided by the rate equals time. The distance of Earth from the sun is 93,000,000 miles, and the speed of light is 671,000,000 mph; therefore, to calculate the amount of time it takes the light from the sun to reach Earth, you would divide 93,000,000 by 671,000,000. Since these numbers are very large, scientists write them in scientific notation first, then divide $\frac{9.3 \cdot 10^7}{6.71 \cdot 10^8}$, and estimate the quotient to be 1.4×10^{-1} . This is a more efficient way to divide large numbers, and it also works with multiplication.

Vocabulary

multiply	a mathematical operation where a number is added to itself a number of times
divide	to divide or division is sharing or grouping into equal parts
numbers	an arithmetical value, expressed by a word, symbol, or figure, representing a particular quantity and used in counting and making calculations and for showing order in a series or for identification
equal	to have the same value

Multiply or divide numbers in scientific notation and express the answer in scientific notation.

1. $(2.6 \times 10^5)(1.9 \times 10^2) =$

2. $(1.6 \times 10^{-3})(2.1 \times 10^{-2}) =$

3. $(5.3 \times 10^4)(1.9 \times 10^3) =$

4. $(6.3 \times 10^{-4})(2.1 \times 10^5) =$

Guided Practice (PA.N.1.3)

Name _____

Multiply or divide numbers in scientific notation and express the answer in scientific notation.

5. $\frac{4.8 \cdot 10^7}{1.2 \cdot 10^3} =$

6. $\frac{9.3 \cdot 10^5}{3.1 \cdot 10^{-2}} =$

7. $\frac{3.6 \cdot 10^{-5}}{6.0 \cdot 10^{-3}} =$

8. $\frac{2.4 \cdot 10^{-6}}{6.0 \cdot 10^2} =$

Solve.

9. What is the ratio of our solar system's radius to the Milky Way's radius given that the distance from Pluto to the sun is 5.9×10^{12} meters; and the Milky Way's disk radius is 3.9×10^{20} meters. Round the coefficient to the nearest tenth.

10. The Sun burns about 4.4×10^6 tons of hydrogen per second. About how much hydrogen does the Sun burn in one year? (*Hint:* one year = 3.16×10^7 seconds) Round your answer to the nearest tenth.

PA.N.1.3 Multiply and divide numbers expressed in scientific notation, express the answer in scientific notation.

Multiply numbers in scientific notation and express the answer in scientific notation.

1. $(7.7 \times 10^3)(8.4 \times 10^4) =$

2. $(4.8 \times 10^{-5})(5.5 \times 10^{-6}) =$

3. $(-6.2 \times 10^2)(-9.1 \times 10^5) =$

4. $(-2.3 \times 10^{-3})(-1.6 \times 10^{-4}) =$

5. $(-4.2 \times 10^4)(6.1 \times 10^7) =$

6. $(2.7 \times 10^{-9})(-3.1 \times 10^{-3}) =$

7. $(-3.2 \times 10^4)(8.1 \times 10^{-7}) =$

8. $(2.4 \times 10^7)(-9.7 \times 10^{-3}) =$

Divide numbers in scientific notation and express the answer in scientific notation.

9. $\frac{3.4 \cdot 10^5}{1.7 \cdot 10^3} =$

10. $\frac{4.0 \cdot 10^{-6}}{8.0 \cdot 10^{-3}} =$

Independent Practice (PA.N.1.3)

Name _____

Divide numbers in scientific notation and express the answer in scientific notation.

11. $\frac{-9.0 \cdot 10^2}{-1.2 \cdot 10^3} =$

12. $\frac{-4.6 \cdot 10^{-2}}{-2.3 \cdot 10^{-5}} =$

13. $(6.4 \times 10^2) \div (1.6 \times 10^{-3}) =$

14. $(-2.3 \times 10^3) \div (1.6 \times 10^{-4}) =$

15. $(-1.12 \times 10^4) \div (3.2 \times 10^{-3}) =$

16. $(-8.88 \times 10^2) \div (2.4 \times 10^{-4}) =$

Use multiplication and division to solve problems in scientific notation and express the answer in scientific notation.

17. $\frac{(8.2 \cdot 10^6)(3 \cdot 10^{-2})}{(2.0 \cdot 10^2)} =$

18. $\frac{(6 \cdot 10^{-7})(3 \cdot 10^{-2})}{(4.5 \cdot 10^2)} =$

Independent Practice (PA.N.1.3)

Name _____

Solve.

19. The speed of light is 3×10^8 meters/second. If the sun is 4.5×10^{14} meters from earth, how many seconds does it take light to reach the earth? Express your answer in scientific notation.

20. A comet burns about 1.8×10^4 tons of hydrogen per second. About how much hydrogen does the Sun burn in one year? (*Hint:* one year = 3.16×10^7 seconds) Round your answer to the nearest tenth.

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Rewrite each number from standard notation to scientific notation.

1. 20,700,000

Rewrite each number from scientific notation to standard notation.

2. 3.4×10^{-3}

Identify if the number is written in correct scientific notation and if not correct it.

3. 26.4×10^5

Complete the table below.

	Exponential Form	Base	Exponent	Numerical/Algebraic Expression	Value
4.	3^4				
5.		g	5		
6.		4			64

Multiply or divide numbers in scientific notation and express the answer in scientific notation.

7. $(6 \times 10^8)(9 \times 10^4) =$

8. $\frac{15 \cdot 10^8}{12 \cdot 10^{-2}} =$

9. $\frac{(4 \cdot 10^6)(5 \cdot 10^{-3})}{(8 \cdot 10^{-4})} =$

Solve.

10. What is the ratio of the mass of Saturn to the mass of Jupiter? The mass of Jupiter is 1.898×10^{27} kilograms and the mass of Saturn is 5.683×10^{26} kilograms. Round the coefficient to the nearest tenth.

PA.N.1.4 Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational.

Real-World Connections

Have you ever wondered where numbers came from? The real number system evolved over time by expanding what we mean by the word “number.” At first, “number” meant something you could count, like how many chickens a farmer owns. These are called the *natural numbers* or sometimes the *counting numbers*.

At some point, the idea of “zero” came to be considered as a number. If the farmer does not have any chickens, then the number of chickens that the farmer owns is zero. You call the set of natural numbers plus the number zero *whole numbers*.

Even more abstract than zero is the idea of negative numbers. If the farmer who has no chickens owes someone 3 chickens, you could say that the number of chickens that the farmer owns is negative 3 or (-3). It took longer for the idea of negative numbers to be accepted; however, they came to be called “numbers.”

An *integer* is a whole number, a number that can be written without a fractional component. The next generalization made was to include the idea of fractions. While it is unlikely that a farmer owns a fractional number of chickens, it could be that a fractional group of the chickens is either hens or pullets.

Many other things in real life are measured in fractions, like a half-cup of milk. If you add fractions to the set of integers, you get the set of *rational numbers*. There are numbers that cannot be expressed as a fraction; these numbers are called *irrational*.

Vocabulary

classify	arrange in categories by characteristics
real numbers	an element of the set of numbers consisting of all rational and all irrational numbers
rational	expressed as a ratio of whole numbers or a decimal that is finite
irrational	cannot be expressed as a ratio of whole numbers or a decimal that is finite
rational number system	consists of rational numbers, integers, whole numbers, and natural numbers
addition	to join two or more numbers or quantities to get one number called the sum or total
multiplication	a mathematical operation where a number is added to itself a number of times
irrational system	part of the real number system that includes numbers when written as a decimal do not terminate or repeat
non-zero rational number	number that occurs naturally, known as counting numbers, 1,2,3.....

Complete the table. Classify each number. Identify the sum and the product and identify the new number.

	First #	Rational/ Irrational	Second #	Rational/ Irrational	Sum	Rational/ Irrational	Product	Rational/ Irrational
1.	2		$\frac{3}{4}$					
2.	0.5		$\sqrt{2}$					
3.	$\sqrt{5}$		$\sqrt{5}$					

Answer in a complete sentence and give an example.

4. Is the rational number system closed under addition and multiplication?

5. Is the irrational number system closed under addition and multiplication?

True or false: Give a counterexample if false.

6. The sum of a rational number and an irrational number is always rational.

Compare the given numbers.

7. $1.36 \square 1.36\bar{6}$

8. $\frac{5}{9} \square 0.55$

Solve.

9. On Monday Phil ate $\frac{1}{4}$ of a lemon pie; on Tuesday he ate $\frac{2}{3}$ of the remaining pie. How much of the pie did he eat on Tuesday? Is this a rational or irrational number?

10. Dr. Vaughn collected 240 mussels from the Little River in Idabel, Oklahoma. One third of them were pistolgrip (*Quadrula verrucosa*); two fifths of the pistolgrips were male. How many female pistolgrips did she collect? Is this number rational or irrational?

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PA.N.1.4 Classify real numbers as rational or irrational. Explain why the rational number system is closed under addition and multiplication and why the irrational system is not. Explain why the sum of a rational number and an irrational number is irrational; and the product of a non-zero rational number and an irrational number is irrational.

Identify the number as rational or irrational.

1. $0.\bar{7}$

2. $\sqrt{2}$

3. $\frac{1}{2}$

4. $\sqrt{4}$

5. π

6. $0.14683\dots$

Solve and identify if the solution is rational or irrational.

7. $6 + 0.1\bar{3} =$

8. $0.5 \cdot \pi =$

9. $\pi \cdot \sqrt{5} =$

10. $-\sqrt{7} + \sqrt{7} =$

11. $\sqrt{10} + \sqrt{10} =$

12. $2.4 + \frac{2}{5} =$

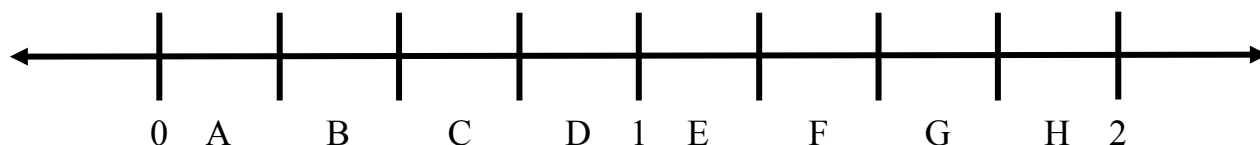
Independent Practice (PA.N.1.4)

Name _____

Solve and identify if the solution is rational or irrational.

13. $\frac{1}{4} \cdot 1.\bar{4} =$

14. $\sqrt{11} \cdot \sqrt{11} =$

Identify the letter from the number that represents the given value.

15. $1.5\bar{6}$

16. $\frac{7}{9}$

17. $\frac{16}{13}$

18. $0.6\bar{6}$

19. Sammi and J.T. are making brownies. The dry ingredients needed are $\frac{1}{2}$ cup of flour and $\frac{2}{3}$ cup of sugar. How many total cups of dry ingredients are used? Is the solution a rational or irrational number?

20. Austin has $\frac{7}{8}$ of a pizza left. If he and a friend finish the pizza, how much of the original pizza will they each get? Is the solution a rational or irrational number?

Identify each number as rational or irrational, solve, and identify the solution as rational or irrational.

1. $2.6 + 0.125 =$

2. $\frac{1}{3} \cdot \pi =$

Compare the given numbers.

3. $\frac{26}{21} \square 1.23$

4. $0.2\bar{2} \square 0.23$

Identify if the number is written in correct scientific notation and if not correct it.

5. $0.0026 \times 10^2 =$

6. $2.6 \times 10^1 =$

Multiply or divide numbers in scientific notation and express the answer in scientific notation. Round to the nearest hundredth place.

7. $(1.3 \times 10^5)(2.2 \times 10^4) =$

8. $\frac{2.5 \cdot 10^{-2}}{3.2 \cdot 10^4} =$

9. $\frac{(2.4 \cdot 10^4)(1.5 \cdot 10^{-2})}{(1.8 \cdot 10^{-5})(2.2 \cdot 10^4)} =$

10. A plant cell in an electron microscope is 1.3×10^3 millimeters wide. The image is 5×10^2 larger than the actual size. How many millimeters wide is the actual cell?

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PA.N.1.5 Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.

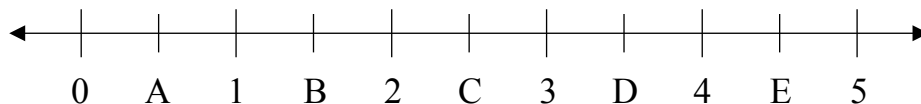
Real-World Connections

In the real-world, people are interested in knowing what values are "normal" and what values are outside of normal, which are values in the tails of a distribution. This does not mean that those on the outside of a normal distribution are abnormal but simply different than the majority. Many factories use the normal distribution to make sure the products they are making are of good quality and interesting to the majority of the purchasing population. The business people at the factory develop a normal distribution of the product, and do not sell any items that measure in the tails of the distribution. To create a normal distribution, you must use squares and square roots? Yes! The equations for finding the tails of a normal distribution use squares and square roots!

Vocabulary

real numbers	an element of the set of numbers consisting of all rational numbers and all irrational numbers
square root	a number is a value that, when multiplied by itself, gives the number
number line	a line in which numbers are marked
perfect square	a number that is a whole number when squared, that is, a number that can be expressed as n^2 for n a whole number
perfect square root	a square root that is a whole number
irrational number	cannot be expressed as a ratio of whole numbers or a decimal that is finite
consecutive positive numbers	positive numbers that follow one another, without gaps, from least to greatest

Circle the number with greatest value and identify where it is on the number line.



1. 1.605

1.52

2. $\sqrt{6}$

4.5

3. 3

$\sqrt{13}$

4. 0.5

$\sqrt{.09}$

Identify if the number is a perfect square or not. If so, give the square root. If not, identify the two consecutive positive numbers on either side of the square root.

5. $\sqrt{36}$

6. $\sqrt{132}$

7. $\sqrt{22}$

8. $\sqrt{225}$

Solve.

9. Marshall knew he needed to seine, net fishing, an area of 25 feet squared to complete his research project. How long did he need his net to be?

10. Stephanie was designing a doll house for her sister's birthday. The square base of the doll house had an area of 780 inches squared. The base of the triangular roof would be between which two lengths?

PA.N.1.5 Compare real numbers; locate real numbers on a number line. Identify the square root of a perfect square to 400 or, if it is not a perfect square root, locate it as an irrational number between two consecutive positive integers.

Compare the following real numbers, use the positive root of all squares. Write <, > or =.

1. $\frac{3}{4}$ 0.7

2. $\sqrt{5}$ 3

3. 12 $\sqrt{144}$

4. $\sqrt{18}$ 3.9

5. $\frac{8}{3}$ 2

6. $\sqrt{14400}$ 126

Order the numbers from least to greatest.

7. 2.8, 4.1, $\sqrt{11}$

8. $5\frac{2}{5}$, $\sqrt{36}$, $4\frac{7}{8}$

9. $\sqrt{75}$, $9\frac{1}{4}$, 8.23

10. $\frac{40}{2}$, 16, $\sqrt{126}$

11. $\sqrt{81}$, $8\frac{1}{6}$, 8.177

12. 1.5, $\sqrt{2}$, $1\frac{1}{4}$

Identify if the number is a perfect square or not. If so, give the square root. If not, identify the two consecutive positive numbers on either side of the square root.

13. $\sqrt{324}$

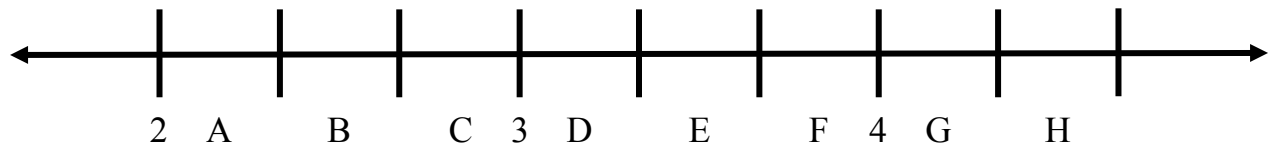
14. $\sqrt{440}$

15. $\sqrt{280}$

Independent Practice (PA.N.1.5)

Name _____

Identify the letter from the number that represents the given value.



16. $\sqrt{15}$

17. $\sqrt{5}$

18. $\sqrt{23}$

Solve.

19. The Math League had a pie eating contest on pie day. Prizes were given for 1st, 2nd, and 3rd. Different students judged the contest and used different forms of numbers, i.e. fractions, decimals, percents, and square roots, to identify how much pie was eaten. Below is the data gathered from the judges. Correctly identify who came in 1st, 2nd, and 3rd.

Name	James	Sara	Richard	Darrin	Rhonda
Pie Eaten	$\sqrt{8}$	$4\frac{3}{4}$	385%	4.65	$\sqrt{24}$

20. Terri wants to put a fence around her tomato plants to keep the rabbits out. The hardware store only sells fencing in five-foot increments. How much wire does she need to buy to go around all of the plants if the area they cover is 150 feet²?

Compare the following real numbers, use the positive root of all squares. Write $<$, $>$ or $=$.

1. $2\frac{3}{4}$ 2.075

2. $\sqrt{22}$ 5

Order the numbers from least to greatest.

3. 3.08, 3.1, $\sqrt{9}$

4. $\sqrt{95}$, $10\frac{1}{4}$, 9.03

Identify if the number is a perfect square or not. If so, give the square root. If not, identify the two consecutive positive numbers on either side of the square root. Identify if the number is rational or irrational.

5. $\sqrt{183}$

6. $\sqrt{196}$

Use multiplication and division to solve problems in scientific notation and express the answer in scientific notation.

7. $\frac{(2.1 \cdot 10^3)(3.2 \cdot 10^3)}{(4.2 \cdot 10^2)} =$

Continuous Review (PA.N.1.5)

Name _____

Given a number in exponential form, a base and exponent, a numerical or algebraic expression, or a base and total value, calculate the missing parts.

	Exponential Form	Base	Exponent	Numerical/Algebraic Expression	Value
8.	2^5				
9.		5			625

Solve.

10. Jaime is helping her dad shear their 36 sheep. Her dad sheered twice as many as Jaime, and together they sheered $\frac{2}{3}$ of the sheep before they took a break for lunch. After lunch, her mother and brother came out to help them finish. If each person sheered an equal number of the remaining sheep, how many sheep will Jaime have shear all together. Is the solution a rational or irrational number?

PA.A.3.1 Use substitution to simplify and evaluate algebraic expressions.
Real-World Connections

Have you ever gone with your family to eat at a buffet that charges different prices based on age? Admission charges at many any events, such as football games, movie theatres, and amusement parks are based on age. An algebraic expression can be written to determine the cost for an unknown number of people.


Order of Operations

G Simplify within Grouping Symbols such as $(\square)\{\square\}[\square]$

E Simplify Exponents

M Perform Multiplication and Division in order from left to right →

S Perform Subtraction and Addition in order from left to right →

Vocabulary

substitution	the exchange of two or more items, in this case the exchange of a given value for a variable
variable	quantity that can change or take on different values, represented by a letter or symbol
coefficient	number before the variable is multiplied by the variable
constant	number that does not change
algebraic expression	mathematical phrase combining number and variables and may include operations and grouping signs, an expression does not contain equality or inequality symbols, however both sides of an equation for inequality is an expression

Write an algebraic expression for the situation.

1. A touchdown is worth 7 points. Write an algebraic expression for total points scored in a game from an unknown number of touchdowns.

2. Carly is four years younger than half her sister's age. Write an algebraic expression for Carly's age based on the unknown age of her sister.

3. Samantha has three more than twice the amount of jellybeans than her sister. Write an algebraic expression for the amount of jellybeans Samantha has.

Write an algebraic expression for the situation.

4. The Broken Arrow swim team competed at the state meet. Sara was 2 minutes faster in her race than the previous state record. Write an algebraic expression for the time Sara swam based on the unknown previous record.

Evaluate the algebraic expression for the given values.

5. $\frac{44}{x}$; when $x = 4$

6. $4b + (-a + c)$; when $a = -3$, $b = 2$, and $c = -5$

7. $\frac{2}{3}m + 10 - (2d)$; when $m = 21$ and $d = 3$

8. $\frac{k - (2n)}{4 + r}$; when $k = 12$, $n = -3$, and $r = -7$

Solve.

9. Tom has 3 dogs. The smallest dog weighs 2 pounds more than a third of the middle dog's weight. The largest dog weighs 4 pounds less than 5 times the weight of the smallest dog. Write an algebraic expression for the weight of each dog. If the middle dog weighs 15 pounds, how much do each of the other 2 dogs weigh?

10. Jalyssa has a bag of marbles. She has half as many blue marbles as red ones. She has 4 less than twice as many red marbles than yellow. Write an algebraic expression for each color of marbles. If she has 10 yellow marbles, how many blue and red ones does she have?

PA.A.3.1 Use substitution to simplify and evaluate algebraic expressions.

Write an algebraic expression for the situation.

1. A pound of hamburger costs \$3.89. Kelly is not sure how many pounds of hamburger she is going to purchase.

2. Alex bought several packs of pencils. Each pack costs \$1.75. Write a variable expression to describe this situation.

3. Charley has 3 less than 4 times as many Pokémon cards as William. Write an algebraic expression to show how many cards Charley has in relation to William.

4. Chris swam the 100 meter butterfly. His coach told him he was 5 seconds slower than the current Oklahoma state record. Chris does not know what the record is. What is an algebraic expression that could represent his time?

5. Jeff and Janice mows yards for the summer. Janice mowed 6 less than 3 times as many as Jeff last weekend. Write an algebraic expression for how many yards Janice mowed.

Independent Practice (PA.A.3.1)

Name _____

Write an algebraic expression for the situation.

6. Ashley is twice as old as Nicki. Nicki is 2 years younger than Charley. Write an algebraic expression for each of their ages.

7. The Tuttle Tiger basketball team set a school record, averaging 6 less points than twice as many points per game than the previous record. Write an algebraic expression for the new record.

8. Aryonna has three ribbons. The longest ribbon is 3 inches shorter than 4 times the smallest ribbon. The smallest ribbon is 2 inches longer than two thirds the middle ribbon. Write an algebraic expression for each of the ribbons.

Evaluate the algebraic expression for the given values.

9. $\frac{x}{12}$; when $x = 60$

10. $\frac{2b + (6 + -c)}{a}$; when $a = -3$, $b = 2$, and $c = -5$

11. $2xy$; when $x = 5$ and $y = 3x$

Independent Practice (PA.A.3.1)

Name _____

Evaluate the algebraic expression for the given values.

12. $6ac \div 2b$; when $a = -2$, $b = 3a$, and $c = -(2a)$

13. $7m + 5d \div 2$; when $m = -2$ and $d = 4$

14. $6ac + 6ad$; when $a = -2$, $c = -a$, and $d = -c$

15. $7g - \frac{6r}{3}$; when $g = -2$ and $r = 2$

16. $9m + 2ad - 6a$; when $m = -3$, $a = -2m$, and $d = \frac{a}{2}$

Solve.

17. Sally is 3 years older than Jill was 5 years ago. Write an algebraic expression for both of their ages. If Jill is 10, how old is Sally?

Solve.

18. Russell Westbrook, of the Oklahoma City Thunder, scored 2 less points than twice as many as the rest of the starting lineup in the first half. The 3 backup players scored half as many points as the starters not counting Russell's points. Write an expression for Russell's points, the remaining starters, and the backup players. If the backup players scored 10 points, how many points did the Thunder team score altogether in the first half?

19. Jeremy, Ryan, and Sunni are comparing baseball cards. Ryan has twice as many cards as Jeremy. Jeremy has 2 more than one third of the number of Sunni's cards. Write an expression for the number of cards they each have. If Sunni has 15 cards, how many do the boys have altogether?

20. Samantha has three dogs. The middle dog weighs one-fifth as much as the large dog. The large dog weighs 15 more pounds than 20 times the weight of the small dog. Write an algebraic expression to show the weight of each dog. If the small dog weighs 3 pounds, what is the difference in the weight of the bigger two dogs?

Write to one power, and solve for the given value.

1. $\frac{m^2}{m^6}$; when $m = 2$

2. $g^3 \cdot g^{-4} \cdot g^5$; when $g = -3$

Identify if the number is written in correct scientific notation. If not, correct it.

3. $3.15 \times 10^5 =$

4. $0.0078 \times 10^{-2} =$

Solve and identify as rational or irrational.

5. $3^2 + (-\sqrt{9} + 3 \cdot 5) \div 4 =$

6. $3\pi(2 + 8) \div 2 =$

List the numbers in order from **greatest** to **least**.

7. $\sqrt{25}$, 2π , 2^2

List the numbers in order from ***greatest to least***.

8. 3^6 , 8^3 , 25^2

Solve.

9. The Barrick family is going to Red Rock Canyon for a family reunion. They thought it would be cool to have shirts made for the event. The Sensational Shirts quoted them a price of \$5 per shirt plus a one-time processing fee of \$8.50. Write an algebraic expression to represent the total cost of the shirts. How much would 17 shirts cost? If they divide the total cost evenly how much will they pay for each shirt?

10. At the reunion, they have a hot dog eating contest. Michael ate 3 more hot dogs than half as many as Crystal. Eric ate twice as many hot dogs as Michael. Write an algebraic expression to represent how many they each ate. If Crystal ate 12 hot dogs, how many did they all three eat in total?

PA.A.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations including the grouping symbols.

Real-World Connections

Mathematicians are like plumbers in that they each have a unique toolbox and sometimes approach a problem in different ways. This is okay as long as they end up with the same solution. One of the tools that is often used differently with the same solution is the use of mathematical properties. These properties can make problems easier to work and quite often save time. Problems can be manipulated through the properties of mathematics to make them simpler and therefore can be solved quicker.

Vocabulary

equivalent expressions	expressions that simplify to an equal value, e.g. $3(x + y)$ is equivalent to $3x + 3y$
properties of operations	rules that set down particular properties in relation to operations on numbers
associative property	of addition states $(a + b) + c = a + (b + c)$, of multiplication states $(a \cdot b) \cdot c = a \cdot (b \cdot c)$, for this operation the addends or factors remain in the same order, but change who they associate with first
commutative property	of addition state $a + b = b + a$, of multiplication states $a \cdot b = b \cdot a$, for this operation the addends or factors move around or commute
distributive laws	states that $a(b + c) = (a \cdot b) + (a \cdot c)$, for this operation multiplying a number by a sum is the same as multiplying the number by each addend and then adding the products

Vocabulary

order of operations

order of operations- convention adopted to perform mathematical operations in a consistent order:

1. perform all operations inside grouping symbols and/or above and below a fraction bar in the order in Steps 2, 3, and 4
2. find the value of any powers or roots
3. multiply, including division, from left to right; add, including subtraction, from left to right

Complete the table for each problem.

Example:

Simplify	Justify
$2 + 57 + 28$	Given
$2 + 28 + 57$	Commutative Property of Addition
$30 + 57$	Addition
87	Addition

1.

Simplify	Justify
$(15 \cdot 25) \cdot 4$	Given

Complete the table for each problem.

2.

Simplify	Justify
12 (5 + 10)	Given

Evaluate.

3. Which of the following illustrates the commutative property of multiplication?

- A $7 \cdot 2 = 2 \cdot 7$
- B $7 \cdot 2 = 6 \cdot 5$
- C $7 \cdot 2 = 10 \cdot 3$
- D $7 \cdot 2 = 9 \cdot 4$

Using the commutative property fill in the missing number.

4. $4 \cdot \underline{\hspace{1cm}} = 8 \cdot 4$

5. $\underline{\hspace{1cm}} + 12 = 12 + 6$

Evaluate.

6. Which of the following illustrates the associative property of addition?

- A $(5 + 3) + 6 = 6 + (5 + 3)$
- B $(5 + 3) + 6 = 8 + 6$
- C $(5 + 3) + 6 = 5 + (3 + 6)$
- D $(5 + 3) + 6 = 5 + 9$

Using the associative property fill in the missing number.

7. $4 + (2 + 7) = 13$; $(4 + 2) + \underline{\hspace{1cm}} = 13$

8. $\underline{\hspace{1cm}} \cdot (3 \cdot 12) = (9 \cdot 3) \cdot 12$

Using the distributive property fill in the missing number.

9. $13(m + 7) = \underline{\hspace{1cm}}m + (13)(7)$

Evaluate.

10.

Tricks and their accompanied points for a surfing video game are shown in the table. You complete 1-360° spin, 3 handstands, and 4 reverse 10's

Trick	Points
360° spin	250
Handstand	350
Reverse 10	400

You need to evaluate the expression $1 \cdot 250 + 3 \cdot 350 + 4 \cdot 400$. Is the answer 2,203 or 2,900? Explain.

PA.A.3.2 Justify steps in generating equivalent expressions by identifying the properties used, including the properties of operations (associative, commutative, and distributive laws) and the order of operations including the grouping symbols.

Evaluate.

1. Which of the following illustrates the commutative property of addition?

- A $7 + 2 = 2 + 7$
- B $7 + 2 = 6 + 5$
- C $7 + 2 = 10 + 3$
- D $7 + 2 = 9 + 4$

Using the commutative property fill in the missing number.

2. $6 + \underline{\hspace{1cm}} = 3 + 6$

3. $m + 2 = 2 + \underline{\hspace{1cm}}$

4. $\underline{\hspace{1cm}} \cdot 7 = 7 \cdot 25$

5. $\underline{\hspace{1cm}} \cdot n = n \cdot 6$

Evaluate.

6. Which of the following illustrates the associative property of multiplication?

- A $(3 \cdot 12) \cdot 10 = (2 \cdot 24) \cdot 10$
- B $3 \cdot (12 \cdot 10) = (3 \cdot 12) \cdot 10$
- C $3 \cdot (12 \cdot 10) = 3 \cdot (2 \cdot 40)$
- D $(3 \cdot 12) \cdot 10 = (12 \cdot 5) \cdot 10$

Independent Practice (PA.A.3.2)

Name _____

Using the associative property fill in the missing number.

7. $8 + (5 + 3) = 16$; $(8 + 5) + \underline{\hspace{1cm}} = 16$

8. $(n + g) + t = \underline{\hspace{1cm}} + (g + t)$

9. $\underline{\hspace{1cm}} \cdot (2 \cdot 5) = (7 \cdot 2) \cdot 5$

10. $(2 \cdot r) \cdot j = 2 \cdot (r \cdot \underline{\hspace{1cm}})$

Evaluate.

11. The commutative and associative properties do not work for subtraction or division. Explain and give an example of each.

Using the distributive property fill in the missing number or symbol.

12. $3(b + 2) = \underline{\hspace{1cm}}b + (3)(2)$

13. $12(5 + 12) = (12 \cdot 5) \underline{\hspace{1cm}} (12 \cdot 12)$

14. $4(12 - 5) = (4)(12) - (4)(\underline{\hspace{1cm}})$

15. $6b - 2b = \underline{\hspace{1cm}}(6 - 2)$

Independent Practice (PA.A.3.2)

Name _____

Find the mistake, if any.

	Problem	What is the error?
16.	$16 - 4 = 4 - 16$	
17.	$(15 \cdot 8) \cdot 10$ $15 \cdot (8 \cdot 10)$ $15 \cdot 80$ 1200	
18.	$b(12 + 15)$ $12b + (12 \cdot 15)$	

Independent Practice (PA.A.3.2)

Name _____

19. You go to Frontier City with your parents, brother and sister. The cost for adults is \$12.50, and the cost for children is \$8.00. Write an expression of the cost for the adults. Write an expression of the cost for the children. Now write an expression of the total cost for adults and children. Evaluate your expression using order of operations.

20. $5 + 12 \cdot 4 - 6 = 47$. Insert grouping symbols into the expression so that it equal to 62 and -19.

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Simplify.

1. $\frac{1.6 \cdot 10^{-6}}{2.0 \cdot 10^{-4}} =$ _____

2. $\frac{3.04 \cdot 10^5}{9.89 \cdot 10^2} =$ _____

Simply and identify the solution as rational or irrational.

3. $22\sqrt{2} + 18\sqrt{2} =$ _____

4. $5\sqrt{5} \cdot 2\sqrt{5} =$ _____

5. Faith is 3 times older than Jamie. Write an algebraic expression for both of their ages. If Faith is 15 years old, how old is Jamie?

Continuous Review (PA.A.3.2)

Name _____

Evaluate the expression for the given value.

6. $x^2 + 3x + 5 - 3y$; when $x = 6$ and $y = 2$

7. $a^3 + 6b - (b)$; when $a = 3$ and $b = -4$

8. $\frac{6a}{\sqrt{c}}$; when $a = -2$ and $c = 3$

9. The length of a rectangle is 3 less inches than twice the width. Write an expression for the width and length. Using the two expressions for the length and width, write and simplify an expression for the area.

10. The Lazy E Ranch in Guthrie, Oklahoma recently sold 2 dozen cattle. One third of the sale was milk cows. How many milk cows were sold?

PA.A.4.1 Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context.

Real-World Connections

There are three classifications of solutions to linear equations: one solution (unique solution), no solution, or infinitely many solutions.

After being simplified, equations with no solution will have coefficients of x that are the same on both sides of the equal sign and constants that are different. For example, $x + b = x + c$, where b, c are constants that are not equal. A numeric example is $8x + 5 = 8x - 3$.

After being simplified, equations with infinitely many solutions will have coefficients of x and constants that are the same on both sides of the equal sign. For example, $x + a = x + a$, where a is a constant. A numeric example is $6x + 1 = 1 + 6x$.

Vocabulary

linear equations	equation that can be written in the form $Ax + By + C = 0$ where A and B cannot both be 0; the graph of such an equation is a line
variable	quantity that can change or that may take on different values, represented by a letter or symbol
solution	value that makes an equation or inequality true

Identify if the given value is a solution for the equation.

- Is 7 a solution for the equation $2x + 12 = 3x + (-2x + 5)$?

Identify if the given value is a solution for the equation.

2. Is 2 a solution for the equation $5x + 6 = 3x - (-2x - 6)$?

3. Is -6 a solution for the equation $3(2x - 8) = -4(-6 + 21)$?

4. Is -4 a solution for the equation $5x(2 - 4) = 2(5x - 4)$?

What value of x makes the equation true?

5. $-3 + 4x + 3(4x + 8) = 4(7x + 3) - 3$

6. $24 - (3x - 9) - 6 = -2(4x - 10) + 5x + 7$

7. $3(x - 2) = 3x + 4$

8. $2\left[\frac{1}{4}(4x - 8) + 3x\right] + 7 = 3(x + 1) + 5x$

Solve.

9. The money from two vending machines is being collected. One machine contains 20 dollar bills and many dimes. The other machine contains 28 dollar bills and many nickels. The number of coins in both machines is equal, and the amount of money that the machines collected is also equal. How many coins are in each machine?

10. A book has an unknown number of pages, but you know Sue read 60 pages the first weekend she had it. She then read $\frac{1}{3}$ of the book on the second weekend. Finally, she read the remaining 84 pages on the third weekend. Using this information, how many pages did the book have? Illustrate the expression for each weekend, the equation for the total number of pages, and the solution.

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PA.A.4.1 Illustrate, write, and solve mathematical and real-world problems using linear equations with one variable with one solution, infinitely many solutions, or no solutions. Interpret solutions in the original context.

Identify if the given value is a solution for the equation.

1. Is 4 a solution for the equation $2x + 12 = 3x + 8$?

2. Is 7 a solution for the equation $3(x + 4) = 2x - (-2x)$?

3. Is -3 a solution for the equation $-2(x + 5) = 4(3x + 8)$?

4. Is -5 a solution for the equation $5x - 12 = -5(-x + 13)$?

What value of x makes the equation true?

5. $24 - 2(5x - 19) = -(-6x - 4) - 10$

Independent Practice (PA.A.4.1)

Name _____

What value of x makes the equation true?

6. $-(x - 7) + \frac{5}{3} = 3(x + 6) - x$

7. $8x - (4x + 7) - 6 = \frac{1}{3}(9x - 21) - 6x + 8$

8. $3(4x + 4) + (x + 8) = 7x - 2(-3x + 11)$

9. $3(2x + 6) - 2 = -2(-3x - 4) - 3$

10. $4(3x + 8) - 2x = 18x - 2(4x - 5)$

11. $14x + 13 - 6x = 4 + 8x + 9$

12. $\frac{1}{3}(12x - 15) = 2(2x - 3) + 1$

Independent Practice (PA.A.4.1)

Name _____

What value of x makes the equation true?

13. $-6(x + 7) = -4x - 2$

14. $9x - 6 + 7x = 16x - 6$

15. $5x + 8 - 7x = -4x + 1$

16. $7(x - 8) = 7x + 42$

Solve.

17. A poster of the OU gymnastics team has a width that is 6 centimeters less than 3 times the length of the poster. The frame around the poster is 44 centimeters. What is the width and length of the poster? How much glass is needed to fit the frame?

Solve.

18. Shawna ran a certain number of miles on Friday. She ran twice as many miles on Saturday. On Sunday, she ran a third as many miles as the sum of Friday and Saturday. If she ran a total of 24 miles over the three days, how many miles did she run each day?

19. Linda and Michelle were shopping for candles to decorate tables for the Miss Oklahoma luncheon. Linda bought 3 packages of candles plus 18 single candles. Michelle bought 6 single candles plus 4 packages of candles. Each package of candles contains the same number of candles. After finishing shopping, Michelle and Linda realized that they had each purchased the same exact number of candles. How many candles are in a package?

20. Alice and Buster are buying Yugioh cards. Alice buys 5 packs and 3 individual cards; Buster buys 3 packs and gives 2 cards to his sister. Each pack has the same number of cards. After Buster gives the 2 cards to his sister, he has exactly half the number of cards as Alice. How many cards are in each pack?

Continuous Review (PA.A.4.1)

Name _____

Write the number in standard notation.

1. 1.34×10^{-8}

2. 2.06×10^{13}

Solve.

3. $y = -3x + 4$; when $x = 3$

4. $y = -3x + 4$; when $x = -3$

5. $y = 2x^2 + 5x$; when $x = 4$

Find the mistake, if any.

	Problem	What is the error?	Work problem correctly
6.	$48 \div 12 \cdot 4$ $48 \div 48$ 1		
7.	$12 (3 + 2) \div 6 + 4 + 5$ $12 (5) \div 10 + 5$ $60 \div 15$ 4		

Solve.

8. Denise tutors students on Tuesday and Thursday. The equation $S = 7h + 25$ represents the amount of dollars Denise is paid each week. If she is paid \$60, how many hours did she tutor?

9. Sam mows lawns on weekends. He gets paid \$10 per lawn plus \$5 per hour. Write an expression and solve if he mows Ms. Greenwich's lawn for 3 hours.

10. Luigi's has a special for the weekend. A small single topping pizza costs \$4 and a serving of spaghetti is \$5. Write an expression for the cost of an unknown number of pizzas. Write an expression for the cost of an unknown number of servings of spaghetti. Now, write an expression that combines both pizza and spaghetti. Evaluate the expression for 5 pizzas and 8 servings of spaghetti using properties and the order of operations.

PA.A.4.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $px + q > r$ and $px + q < r$, where p , q , and r are rational numbers.

Real-World Connections

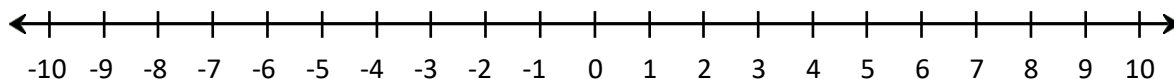
In this lesson, you will represent, write, solve and graph linear inequalities on a number line. Inequalities have more than one solution. Mathematical inequalities are used around you almost every day. You may not realize they are inequalities because they are so familiar. Think about the situations such as, highway speed limits, number of text messages you can send each month from your cell phone, number of toppings possible on a pizza, and the amount of money you could spend at the mall. All of these can be represented as mathematical inequalities. You use mathematical reasoning and problem solving as you work through these situations every day.

Vocabulary

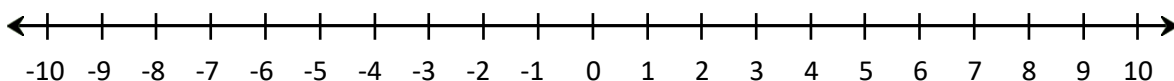
linear inequalities	a linear function that contains one of four inequality symbols: less than ($<$), greater than ($>$), less than or equal to (\leq), or greater than or equal to (\geq)
variable	quantity that can change or that may take on different values, represented by a letter or symbol
rational numbers	number expressible in the form $\frac{a}{b}$ or $-\frac{a}{b}$, a and b are both whole numbers

Graph the following inequalities.

1. $x > -1$

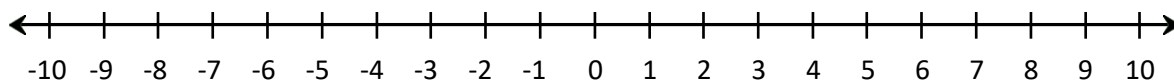


2. $x \leq 8$



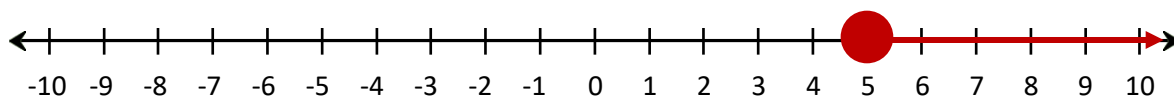
Graph the following inequalities.

3. $x < 5$

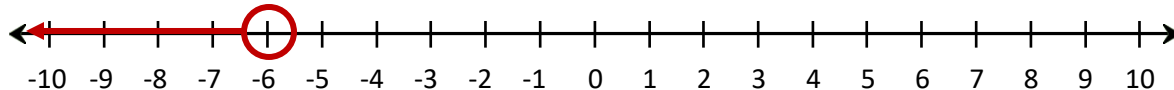


Identify the inequality shown on the graph.

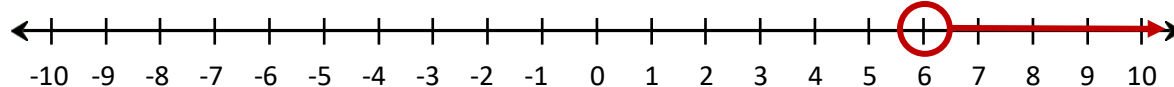
4.



5.

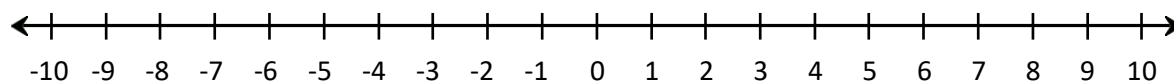


6.



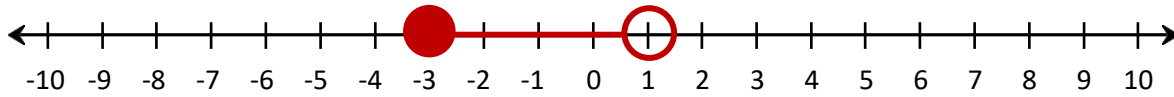
Graph the compound inequality.

7. $x < -1$ or $x \geq 3$



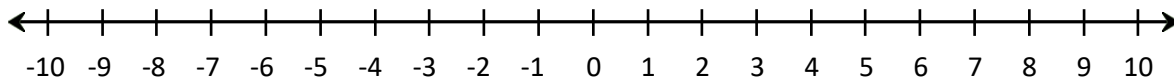
Identify the compound inequality graphed.

8.

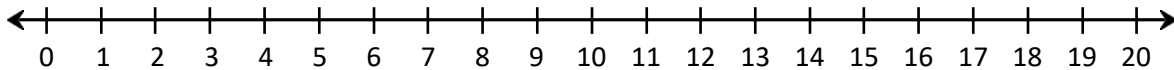


Solve and graph the following inequality.

9. $-6x + 2 \leq 20$



10. Christopher has \$150 to spend on tax free weekend. He buys 3 shirts at \$10.00 each. Write an inequality that shows the greatest number of shirts he can buy at \$10.00 each? Graph the solution.

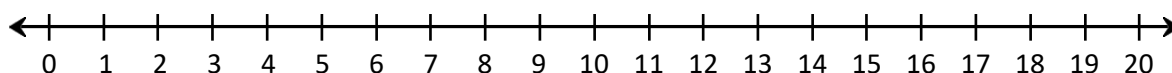


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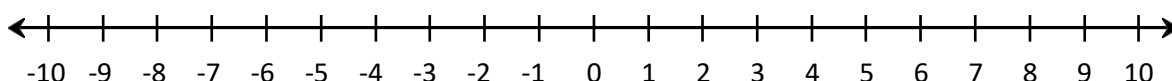
PA.A.4.2 Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $px + q > r$ and $px + q < r$, where p , q , and r are rational numbers.

Graph the solution set or sets of the following inequalities.

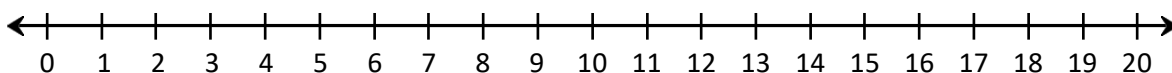
1. $x \leq 16$



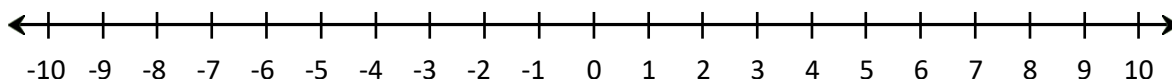
2. $-4 > x$



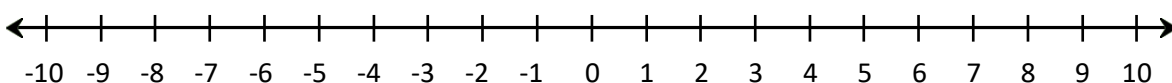
3. $x > 8$



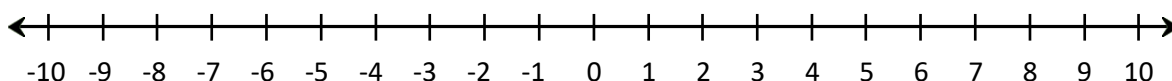
4. $x \geq -2$



5. $x \geq -4$ and $x < 0$

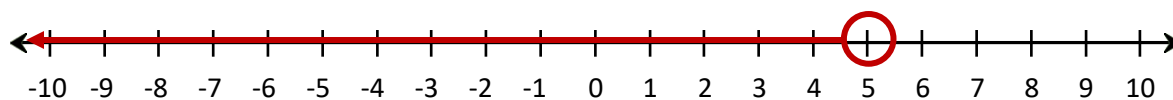


6. $x \leq -3$ or $x > 2$

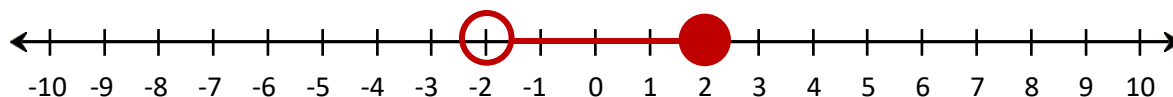


Give the inequality represented by each of the following number lines.

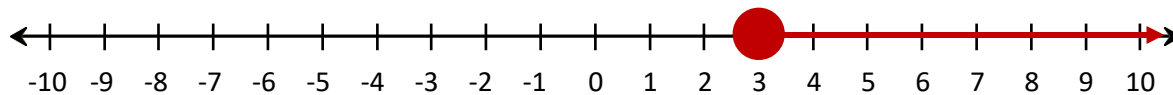
7.



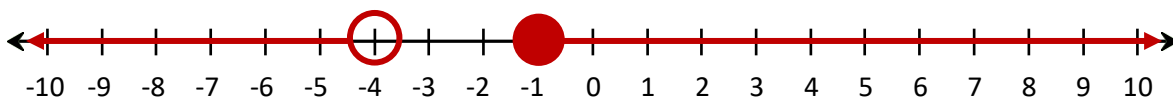
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9.

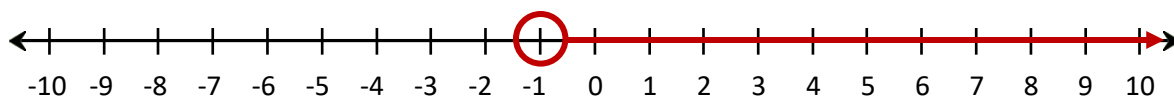


10.

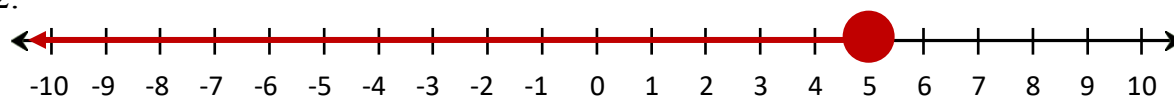


Give the inequality represented by each of the following number lines.

11.



12.



Solve the inequality.

13. $\frac{x}{2} + 3 > 9$

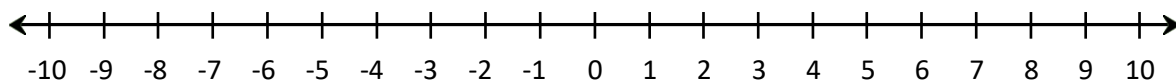
14. $-4x + 5 \leq 13$

15. $x + 5 > 6$ and $6x \leq 18$

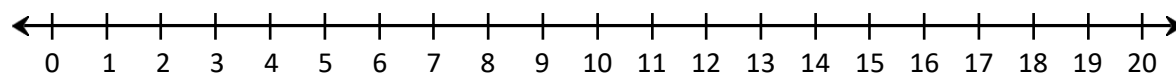
16. $x + 2 \leq -3$ or $x - 5 > -2$

Solve and graph the solution set for the following inequalities.

17. $x + 6 < 3$

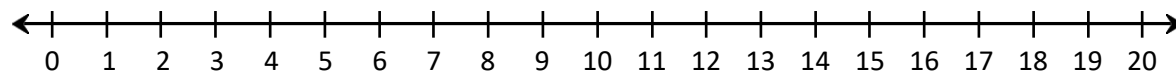


18. $\frac{x}{3} - 5 \geq -2$

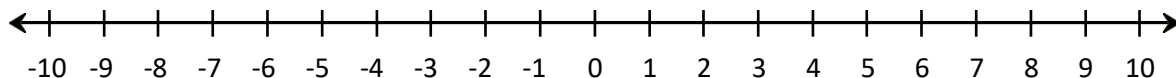


Solve.

19. Wetumka (x) is at most 10 miles from Weleetka, depending on the route you take. How many miles is Wetumka from Weleetka?



10. Clinton must write an essay of at least 6 pages in 2 days. How many pages (x) must he write a day to complete his assignment? Solve and graph.



Solve in standard notation.

1. $\frac{(0.5 \cdot 10^2)(0.3 \cdot 10^3)}{1.5 \cdot 10^8} =$

2. $(1.8 \times 10^4)(2.6 \times 10^{-2}) =$

3. $\frac{(0.7 \cdot 10^{-5})(0.4 \cdot 10^9)}{(1.2 \cdot 10^7)} =$

Solve. Is the solution rational or irrational?

4. $\sqrt{25} \cdot \sqrt{81}$

Identify if the given value is a solution for the equation.

5. Is -2 a solution for the equation $5x + 11 = 4x + (-2x + 5)$?

What value of x makes the equation true?

6. $-3(-4x - 1) = 2(6x + 3) - 3$

7. $5(x - 1) = 5x + 4$

Use the following scenario to answer questions 8-10.

Gregory is saving money to buy an anniversary gift for his parents. He wants to have a collage of pictures from their wedding and the births of his 3 siblings and himself. He found a website that will do it for \$87.50. He earned \$50 last weekend for babysitting his little cousin. He receives \$25 a week for his allowance.

8. Write an algebraic expression for how many weeks it will take to earn the money if he puts back half of his babysitting earnings and saves half of his allowance each week.

9. If he follows the plan in the above question, how many weeks will it take Gregory to earn the money?

10. How many weeks will it take for Gregory to earn the money if he uses all of his babysitting earnings and half of his allowance?

PA.A.4.3 Represent real-world situations using equations and inequalities involving one variable.**Real-World Connections**

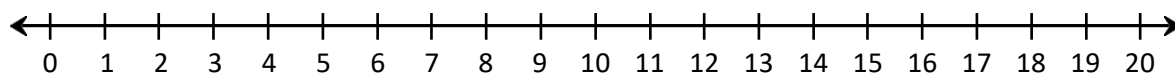
Have you ever wondered, “When will I use this in real life?” Have you heard an adult say that they do not use what they learned in math? The truth is, you cannot make it through a single day without using mathematics. If someone is holding a fundraiser or has their own business, they must use an equation or inequality to determine profit. Getting to school or work on time also uses an equation or variable. If you are in construction or drive a truck, you must use math to be successful. Even if you just want to save money at the store, you will use math to calculate the better buy. Today, you will practice writing and solving equations and inequalities in real-world situations. You will also address misconceptions associated with equations and inequalities.

Vocabulary

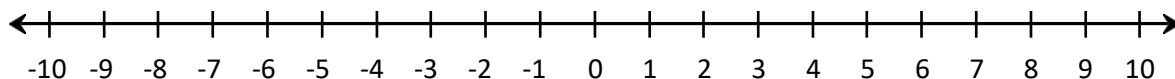
equations	number sentences that use the equal sign, it may or may not have mathematical operations ($1 + 2 = 3$)
inequalities	occur when things are not equal, there are 4 types of inequality: a is less than b ($a < b$), a is greater than b ($a > b$), a is less than or equal to b ($a \leq b$), or a is greater than or equal to b ($a \geq b$)
variable	quantity that can change or that may take on different values, represented by a letter or symbol

Solve and graph.

1. Five more than 2 times a number is greater than or equal to seventeen.



2. A rectangle has a length 3 more than 6 times the width. If the perimeter is less than or equal to 34 units, find the greatest possible width and graph it.



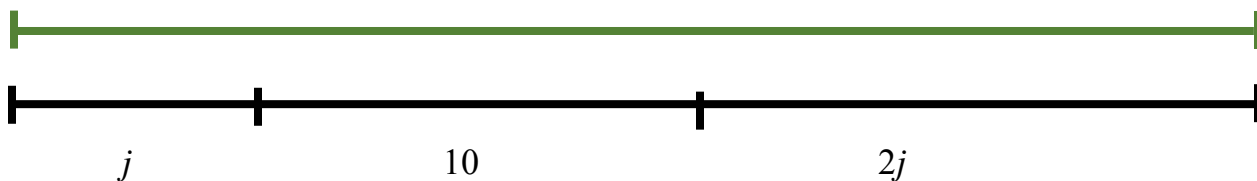
Solve.

3. List the three largest consecutive integers whose sum is at most 39.

Solve.

4. Write an equation that says that the length of the green line is equal to the length of the black line. Combine like terms. Then solve for j .

28



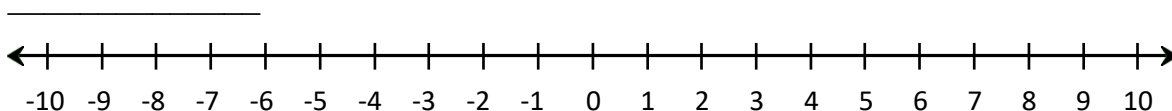
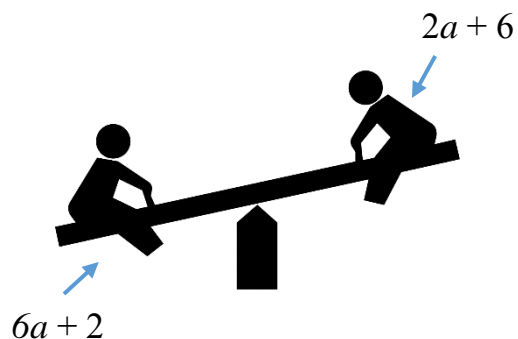
5. Write an equation that says that the length of the black line is equal to the length of the green line. Combine like terms. Then solve for h .

32



Solve and graph.

6.



Solve and graph.

7. Erica must tutor a minimum of 20 hours per week in order to remain in the National Honor Society. She has a student that she tutors for 5 hours every Saturday. She is not available for tutoring on Sundays. What is the least she can work each weekday, if she wants to work the same amount each day?

Write a possible scenario for the given equation or inequality.

8. $30h = \$120$

Write a possible scenario for the given equation or inequality.

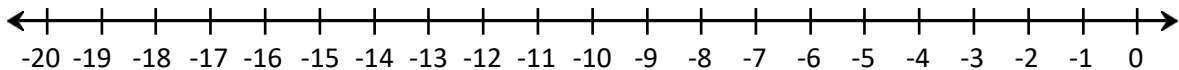
9. $x \geq 20$

10. $12 + c \leq 30$

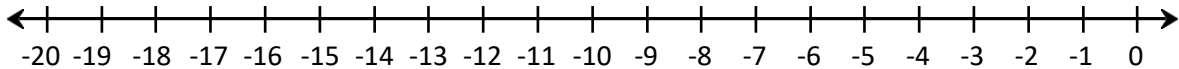
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PA.A.4.3 Represent real-world situations using equations and inequalities involving one variable.*Solve and graph.*

1. Three less than four times a number is greater than or equal to three more than five times the number.



2. Five less than five times a number is less than six times the same number plus 2.

*Write an equation or inequality to represent the scenario.*

3. Seven less than one-third a number is greater than six more than one-fourth the number.

4. The product of six and the sum of a number and two has the same value as two less than the product of the same number and twenty.

Independent Practice (PA.A.4.3)

Name _____

Use an equation or inequality to solve the problem associated with the scenario or picture.

5. A rectangle has a length at least four more than five times the width. If the perimeter is at least 44 units, find the least possible width.

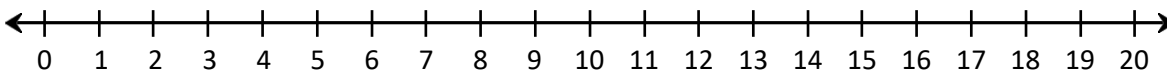
6. The middle side of a triangle is half of 3 times the length of the shortest side. The longest side is 2 centimeters longer than the middle side. If the perimeter of the triangle is 18 centimeters, what is the difference in the longest and shortest side?

7. Find the three consecutive odd integers with a sum of 27.

8. Find the largest three consecutive odd integers possible with a sum that is less than 64.

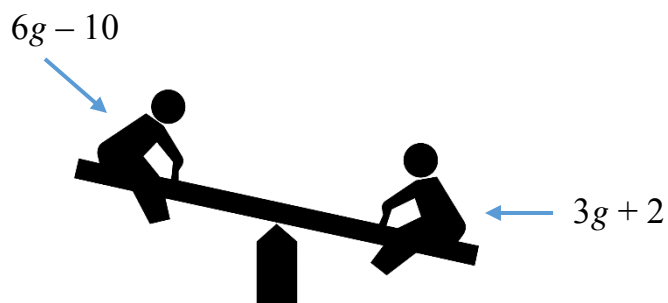
Use an equation or inequality to solve the problem associated with the scenario or picture and graph the inequality.

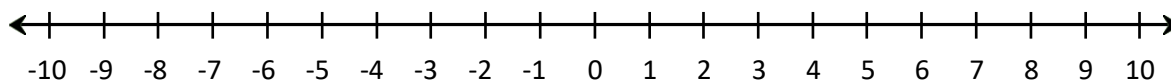
9. Ten less than three times a number is greater than three more than twice the same number.



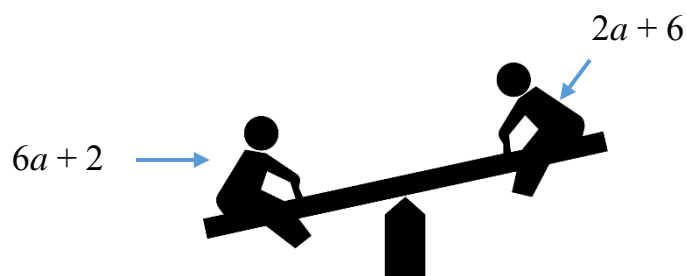
Use an equation or inequality to solve the problem associated with the scenario or picture and graph the inequality.

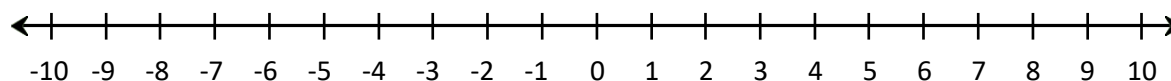
10.





11.





Independent Practice (PA.A.4.3)

Name _____

Use an equation or inequality to solve the problem associated with the scenario or picture.

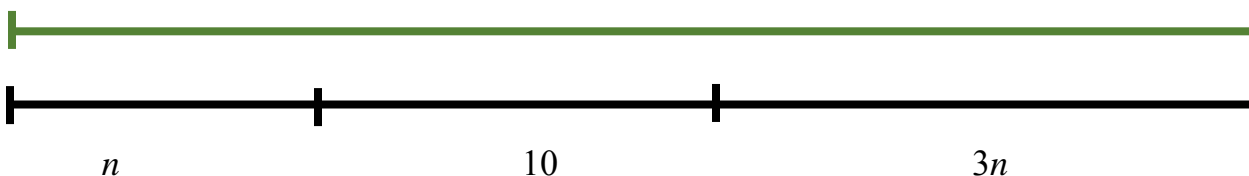
12.

12



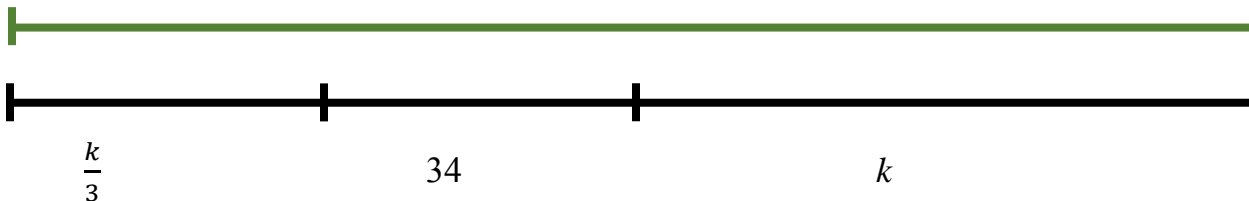
13.

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14.

326



Independent Practice (PA.A.4.3)

Name _____

Write a possible scenario for the given equation or inequality.

15. $300 = 60t$

16. $1.50t + 7.99 \leq \$15.00$

17. $15w + 65 \geq \$150$

Solve.

18. Ms. Apple is expanding her restaurant in Kenton, Oklahoma. She has enough booths to seat up to 40 people. She is ordering tables for seating to fill the newly added on space. Each table can seat up to 6 people, and she plans to seat up to 125 people in the dining area. Write an inequality that Ms. Apple can use to determine the number of tables (t) that she needs to order. How many tables does she need to order?

Solve.

19. You can buy a seat cushion at the College Softball World Series for \$4. They paid \$2.50 to have them made, and they make a profit of \$300 when sold out. How many seat cushions did they have made?

20. Mariah runs a minimum of 25 miles a week to prepare for the 5k in Oklahoma City next Spring Break. She runs an equal amount on Tuesday and Thursday and 3 times that amount on Saturday. What is the least she must run on Tuesday?

Simplify using properties and the order of operations.

1. $\frac{(3 \cdot 2 + 8) \div 2}{(35 \div 5) \div 7} =$

2. $[2 + 6(12 \div 3) - 6] + 4 =$

3. $48 \div 4 \cdot 3 - 6 + 2 =$

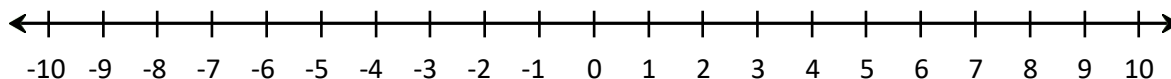
What value of x makes the equation true?

4. $-3(2x + 2) = 2(-3x - 3)$

5. $7 + 3(x - 1) = 5x + -2(x + 1)$

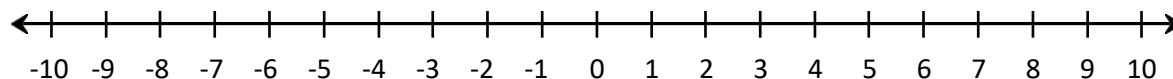
Graph the following inequalities.

6. $3 \leq x$



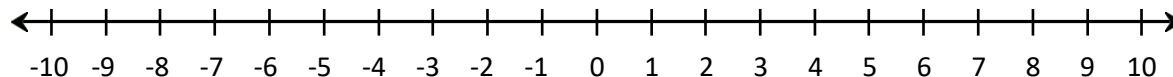
Graph the following inequalities.

7. $x < -3$



Graph the compound inequality.

8. $x \geq -4$ and $x < 0$



Solve.

9. Jim has \$700 in savings at the beginning of summer. He wants to have at least \$300 in savings when he goes to buy back-to-school clothes. He withdraws \$25 per week for spending money. How many weekends can he withdraw this amount and still have the amount he wants to buy back-to-school clothes?

10. A cab service charges a flat rate of \$3.25 and an additional \$.75 per mile. Ashley has \$10. What is the maximum number of miles Ashley can travel?

PA.A.1.1 Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable.

Real-World Connections

Functions are important as mathematical representations of input/output relationships, but they are also found in many aspects of our daily lives. The amount of gas that is put into a car (input) determines the number of miles that the car can go (output). A person's weekly salary is a function of the number of hours worked (input) and their weekly pay (output). When looking at a function, there is a direct relationship between the input and the output. The input value occurs independent of the output, and is therefore the independent variable. While the output value is dependent on the input and is therefore the dependent variable. Since this relationship is a direct relationship, there can only be one output for each individual input.

Vocabulary

function	a rule that assigns to every element of one set (the domain) exactly one element of another set (the range) often thought of as an "input/output" rule, as in every input determines an output
independent variable/domain (x)	the set of "input" or argument values for which the function is defined or the quantity whose value is changed
dependent variable/range (y)	set of all "output" or possibilities after substituting the domain or the quantity that is affected when the input or independent variable is changed
variable	letter or symbol that represents a quantity that can change or that may take on different values

Complete the following table.

	x , input, domain, independent variable	function	y , output, range, dependent variable
1.	5	$y = 2x$	
2.		$y = \frac{1}{3}x + 2$	9
3.	3		12

Identify the independent and dependent variables in the following scenarios.

4. The Oklahoma State FFA Convention will be at the Cox Center® in Oklahoma City. 240 students from across the state of Oklahoma are attending the convention. Each room will hold 4 students.

5. CAPS Middle School in Norman is hosting a Carnival for the elementary students as a fundraiser. They will need 150 booths in order to have a successful carnival. 50 of the booths requires 3 volunteers and 100 booths require 2 volunteers based on the type of booth.

Find the missing value and identify it as an independent or dependent variable.

6. Find the value y for the function $y = \frac{1}{4}x - 3$, given that $x = 72$. Are you finding the independent or dependent variable for the function?

7. Find the value of x for the function $y = 3(x + 3)$, if y has a value of 75. Are you finding the independent or dependent variable for the function?

Identify the independent and dependent variables in the following scenarios.

8. The Kiddie Land Park in Duncan has several rides requiring 2 tickets each for adults. A family pack includes entrance for four people, four drinks, four bags of popcorn, and 80 ride tickets. If a mom, dad, and two children visit the park and purchase a family pack, how many tickets will each child have if they ride an equal amount, and neither parent rides any? Are you finding the dependent or independent variable?

Determine if the given situation is a function.

9. The taller a person is, determines the longer arm span they will have.

10. The dolphin ride at the aquarium in Jenks is broken. You can put in 1 token and sometimes get anywhere from 1 ride to 6 rides.

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PA.A.1.1 Recognize that a function is a relationship between an independent variable and a dependent variable in which the value of the independent variable determines the value of the dependent variable.

Complete each function table.

1.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	2	$y = 7x - 5$	
	5		

2.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
		$y = 2x + 3$	11
			15

3.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
		$y = \frac{1}{5}x - 2$	13
	60		

4.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	21	$y = \frac{1}{3}x + 6$	
			10

5.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	6		20
	8		24

Independent Practice (PA.A.1.1)

Name _____

Complete each function table.

6.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	60		9
	28		1

7.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	5		9
	9		21

8.	x , Input, Domain, Independent Variable	Rule/Function:	y , Output, Range, Dependent Variable
	27		16
	24		15

Identify the independent and dependent variables in the following scenarios.

9. The Hall Family Reunion is being held at Beaver's Bend State Park in Broken Bow, Oklahoma. Each cabin can sleep 12 people, and 68 family members have committed to attend.

10. Frederick Elementary is going on a trip to Quartz Mountain State Park in Lone Wolf, Oklahoma. Each bus holds a maximum of 35 students, and requires 3 adult chaperones for monitoring. There are 165 students attending the trip.

Find the missing value and identify it as an independent or dependent variable.

11. Find the value y for the function $y = \frac{1}{4}x + 5$, given that $x = 60$. Are you finding the independent or dependent variable for the function?

12. Find the value of x for the function $y = 6(x - 4)$, if y has a value of 18. Are you finding the independent or dependent variable for the function?

13. Find the value y for the function $y = \frac{1}{3}x - 8$, given that $x = 21$. Are you finding the independent or dependent variable for the function?

14. Find the value of x for the function $y = -2(x + 7)$, if y has a value of 20. Are you finding the independent or dependent variable for the function?

15. The Chief Drive-In Theatre in Chickasha charges \$15 per vehicle. The CREW from Word Alive Church in Lawton took a group and paid \$105. How many vehicles did they take? Are you finding the independent or dependent variable?

Find the missing value and identify it as an independent or dependent variable.

16. The Toy and Action Figure Museum in Pauls Valley, Oklahoma charges a \$7 entrance fee. The Bledsoe family took 3 adults and 5 children. What was the total cost for them to enter the museum? Are you finding the independent or dependent variable?

Determine if the given situation is a function.

17. Every person that enters the University of Oklahoma's girl's sporting events in the month of October received a free pink shirt in honor of Breast Cancer Awareness month.

18. The farther away an object is the smaller it appears.

Solve.

19. Lucille and her family are going to an Oklahoma City Thunder game. The distance from her house to the Cox Center is 90 miles. If her dad drives at a constant speed of 75 miles per hour with no stops, how long will it take them to get there? use $d = rt$. Identify the dependent and independent variables.

20. Lucille and her brother both had free tickets that they won at school. Her parents paid a total cost (c) of \$80.00 for their two adult tickets (a) and parking (p), which was \$15, how much was each ticket? Use $c = 2a + p$. Identify the dependent and independent variables.

Continuous Review (PA.A.1.1)

Name _____

Write as one power.

1. $m^4 \times m^5 =$

2. $\frac{b^7}{b^3} =$

Write in correct scientific notation.

3. $17.06 \times 10^5 =$

Solve and write answer in correct scientific notation.

4. $\frac{(9 \cdot 10^{-2})(2 \cdot 10^{-2})}{(0.6 \cdot 10^{-2})} =$

Identify each addend or factor as rational or irrational, solve, and identify the sum or product as rational or irrational.

5. $\sqrt{169} + 3.6 =$

6. $\sqrt{50} \cdot 2 =$

Simplify the radical.

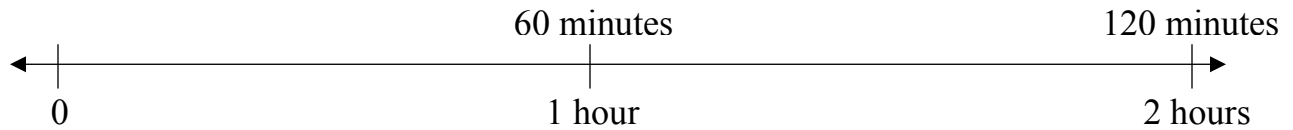
7. $\sqrt{243} =$

Identify which two whole numbers the root would come between.

8. $\sqrt{85} =$

Solve.

9. Coach Dunn took her basketball girls to run up Mt. Scott for preseason training. Sammi was the first to the top followed by Allison and then Mariah. Their times were written out of order as 80 minutes (Allison), 52 minutes (Sammi), and $1\frac{1}{2}$ hours (Mariah). Using the initial of their first name, put them in order on the number line.



10. Mrs. Bledsoe's science class took a virtual field trip to Beaver's Bend in southeastern Oklahoma. They looked at Cottonwood trees in four locations and created this table.

Location	Average Rainfall	Average Height
1	1.3 inches	7.3 meters
2	3.6 inches	9.8 meters
3	4.7 inches	10.4 meters
4	2.8 inches	8.5 meters

Jim's group made the following statement:

The amount of rainfall is dependent on the height of the tree in that the taller the tree the more it would rain.

Do you agree with this statement? If not, correct it.

PA.A.1.2 Use linear functions to represent and explain real-world and mathematical situations.**Real-World Connections**

Linear functions happen anytime you have a constant rate of change. Pretty much any time you hear "_____ per _____" or "_____ for every _____" there is a linear equation involved as long as that rate stays constant. You use a linear function when taking a cab ride, ordering pizza, choosing a cell phone company, or any time you purchase multiple items at a certain price.

Vocabulary

linear function	a function (f) is linear if can be written in the form $f(x) = mx + b$
------------------------	--

Identify the inverse operation.

1. $x + 6$

2. $7n$

3. $y - 4$

Identify what needs to occur to keep the function in balance.

4. $s - 8 = 12$

$s - 8 + 8 = 12$

5. $\frac{n}{5} = 20$

$5\left(\frac{n}{5}\right) = 20$

Solve each real-world scenario.

6. If Joshua babysits for \$8 an hour, write a function that shows his total pay (t)? How much would he make Friday night if he watched Mrs. Porter's daughter for three hours? How much would he make Saturday night, if he watched Mr. Cothren's son for five hours? How much would he make Sunday afternoon, if he watched Mr. Doughty's daughter for four hours? How much did he earn for the entire weekend?

7. Malia mows lawns for extra money during the summer. She charges \$10 per yard plus \$4 for each hour. Write a linear function to show the total she charges (c) per lawn? What does she charge for a lawn that takes 3 hours and 30 minutes to mow?

8. Nicki and Remi have a lemonade stand. The initial cost of supplies is \$15, and they charge \$0.75 for a cup of lemonade. Write a function that shows their total profit (p). How many cups must they sell to begin making a profit?
(Profit = Sales – Costs)

Solve each real-world scenario.

9. Mrs. Riley is taking her students to the aquarium in Jenks. She received quotes from two charter bus companies. OK Bus Line charges \$55 for a bus plus \$3.50 per student, and Rumble Charters charges \$75 for a bus plus \$2.25 for every student. Write a function for each charter company. If she is taking 25 students, which company will cost the least amount of money?
-

10. For having perfect attendance, Mr. Dees is taking a group of students to Celebration Station in Oklahoma City. He was given two options to pay. Option one includes lunch and unlimited game time for \$15 and an additional charge of \$3 for each game of laser tag. Option two includes lunch and unlimited game time for \$18 and an additional charge of \$1.50 per game of laser tag. Write a function to show the total cost of each option. The two options are the same after how many games of laser tag?
-

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PA.A.1.2 Use linear functions to represent and explain real-world and mathematical situations.

Identify the inverse operation.

1. $\frac{r}{4}$

2. $m - 15$

3. $21k$

4. $m + 16$

5. $17g$

6. $p - 24$

Identify what needs to occur to keep the function in balance.

7. $18a = 36$

$$\frac{18a}{18} = 36$$

8. $z + 4 = 18$

$$z + 4 - 4 = 18$$

9. $t - 3 = 15$

$$t - 3 + 3 = 15$$

10. $\frac{n}{6} = 42$

$$6\left(\frac{n}{6}\right) = 42$$

Solve each real-world scenario.

11. If Jessica walks dogs for \$7 per dog, write a function that shows her total pay (p). How much would she make Friday night if she walked 7 dogs? How much would she make Saturday night if she walked 15 dogs? How much would she make Sunday afternoon if she walked 11 dogs? What would be her total earnings for the weekend?

Solve each real-world scenario.

12. Rosita is having a garage sale. She sells pants for \$5 each, shirts for \$3 each, and shoes for \$11 a pair. Write a function for each item. How much does she make for selling 12 pairs of pants? How much does she make for selling 21 shirts? How much does she make for selling 6 pairs of shoes? What did she earn in total sales?
-

13. During the summer, Malcolm has a paper route to earn extra money. He is paid \$12 each weekday plus \$0.30 per paper and \$15 on the weekend plus \$0.50 per paper. Write a linear function to show the separate amounts he earns on weekdays and weekends? What does he earn on a weekday if he throws 25 papers? What does he earn on a weekend if he throws 40 papers?
-

14. Ladaysha delivers pizzas for Olive's Pizzeria. She is paid \$20 plus \$3.50 per delivery. Write a function to show her earnings in one day. What is her total daily pay if she has 16 deliveries?
-

15. The Middle School Math League is having a bake sale to earn money to pay for their trip to the state competition in Tulsa. The cost for ingredients will be \$135, they sell each item for \$1.25. Write a function that shows their total profit (p)? How many items must they sell to begin making a profit?
-

Solve each real-world scenario.

16. Jeffrey's family starts a kayaking business at Lake Texoma. They purchase 25 kayaks for \$186 each. They rent the kayaks for \$7.50 per hour. Write a function that shows their profits. How many hours must they rent their kayaks to make \$1,500 profit?

17. Dominique is getting a cell phone for his birthday. His parents looked at two companies to find the best buy. Cells-R-Us has a special that is \$35 for the first 10 gigs of data and \$2 per additional gig. Infinity Cellular offers 10 gigs for \$28 and each additional gig for \$1.50. Write a function for the cost of each company. If Dominique expects to use 15 gigs of data, which company should his parents choose?

18. Breanna and Aaron are planning a wedding. They are looking at reception locations. Impressions has a reception hall for \$225 and charges \$8 per person for a full meal with drink included. Enchanted Gardens has a banquet hall for \$275 and charges \$6 per person for a full meal with drink included. Write a function to show the cost of each location. If Breanna and Aaron plan on having 150 guests, where should they hold their reception to save the most money?

Solve each real-world scenario.

19. The pom-pom squad is looking for a dance camp to attend over the summer. The cost of a camp at ECU in Ada, Oklahoma is \$625 plus \$12 per dance student. The camp at SWOSU in Weatherford, Oklahoma is \$754 plus \$9 per dance student. Write a function for the cost of each camp. For what number of dancers would the cost be the same at either camp?
-

20. For Spring Break, the Alpha Plus staff is planning a team building trip for Spring Break in Tahlequah, Oklahoma. On one day, they plan to float down the Illinois River. Fannie's Floatables charges a \$55 reservation fee and \$12.50 per raft. Ricky's River Rats charges a \$30 reservation fee and \$15 per raft. Write a function to show the cost of each business. For what number of rafts would the cost be the same?
-

Write in correct scientific notation.

1. $263.05 \times 10^{-4} =$

Solve and write the answer in correct scientific notation.

2. $\frac{(3.5 \cdot 10^2)(12.5 \cdot 10^3)}{(1.25 \cdot 10^2)} =$

Identify each addend or factor as rational or irrational, solve, and identify the sum or product as rational or irrational.

3. $\sqrt{625} + 2.7 =$

4. $\sqrt{125} \cdot 6 =$

Put these numbers in order **Least** to **Greatest**.

5. $12.6 \quad \sqrt{135} \quad 2^3$

Identify the set of ordered pairs as a function or not a function.

6. $\{(2, 5), (4, 7), (2, -5), (4, -7)\}$

7. $\{(0, 2), (3, 2), (6, 2), (9, 2)\}$

Solve.

8. Sara is collecting data for a science project on the growth of a potato plant. Each plant had an initial height of 10 centimeters. Her data is in the following table.

Plant	Height after 2 days	Height after 4 days	Height after 6 days
Plant A (fed 2 grams daily)	16 centimeters	22 centimeters	28 centimeters
Plant B (fed 1 gram daily)	12 centimeters	14 centimeters	16 centimeters

Name the dependent and independent variable for her project. Write a function to show the growth of each plant. What would be the difference in the heights of the two plants after 12 days?

Dependent variable: _____

Independent variable: _____

Difference in height after 12 days _____

-
9. The Oklahoma State FFA officers are wanting to raise enough money to go to the national convention. They are selling sports bottles at a profit of \$6.50 each. Write a function to show their total profit (p). If the cost of the convention is \$143 per person, how many bottles must they sell for all 16 officers to attend the convention? (Profit = Sales – Costs)

Solve.

10. Mrs. Apple is planning to take her class on a trip to see the Oklahoma City Blue basketball team. There are two options available for field trips. One costs \$165 for unlimited students to attend the game and get a hot dog and drink, plus \$2 per student to high five the players as they enter the court before the game. The second option costs \$135 for unlimited number of students to attend and get a hot dog and drink, plus \$3 per student to high five the players as they enter the court before the game. Write a function for the total cost of each option. For how many students are the two options the same cost? If Mrs. Apple has 25 students, which option should she choose to save money?
-

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PA.A.1.3 Identify a function as linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line.

Real-World Connections

A function can be linear or nonlinear. Linear means in a straight line and a function has exactly one output for each input; therefore, a linear function is a straight line where each input has exactly one output. These functions can be written in slope-intercept form $y = mx + b$. Horizontal lines are written as $y = b$ (which means $y = 0x + b$), where b is the value of y for every ordered pair. A graph of the equation $y = 6$ includes the same output value of 6 for all input values on the line such as $(0, 6)$, $(2, 6)$, $(4, 6)$. Horizontal lines ARE functions because the relation (set of points) has the characteristic that each input is related to exactly one output. Vertical lines have an undefined slope, and cannot be represented by the form $y = mx + b$, but rather $x = c$ because the vertical line intersects a value on the x -axis c . For example, the graph of the equation $x = 4$ includes the same input value of 4 for all points on the line but would have different output values such as $(4, 1)$, $(4, 3)$, $(4, 5)$. Although it is linear, vertical lines are NOT functions since each input is related to more than one output.

Vocabulary

linear	in a straight line, the exponent of the variable term (x) is a one (first power)
graph	visual diagram used to represent statistical information or functions and equations
straight line	a line with no bends or curves, shortest distance between two points

Complete the table below.

	m , slope, rate of change	linear function	b , y-intercept
1.	5		-2
2.		$y = \frac{1}{2}x + 4$	
3.	0		6
4.		$y = -4x + 1$	
5.	$-\frac{2}{3}$		0

Solve for y to determine if the equation represents a linear function

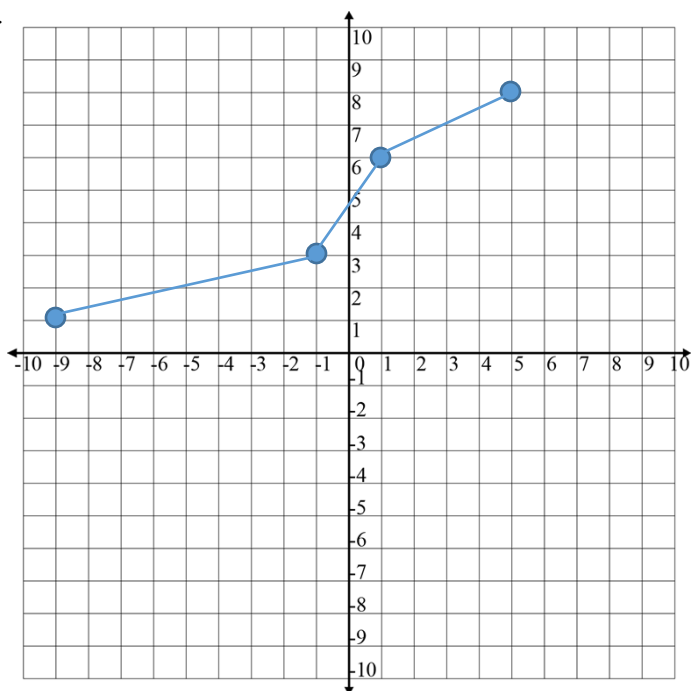
6. $-2x + 6y = 12$

7. $2y + 3x = 3x + 8$

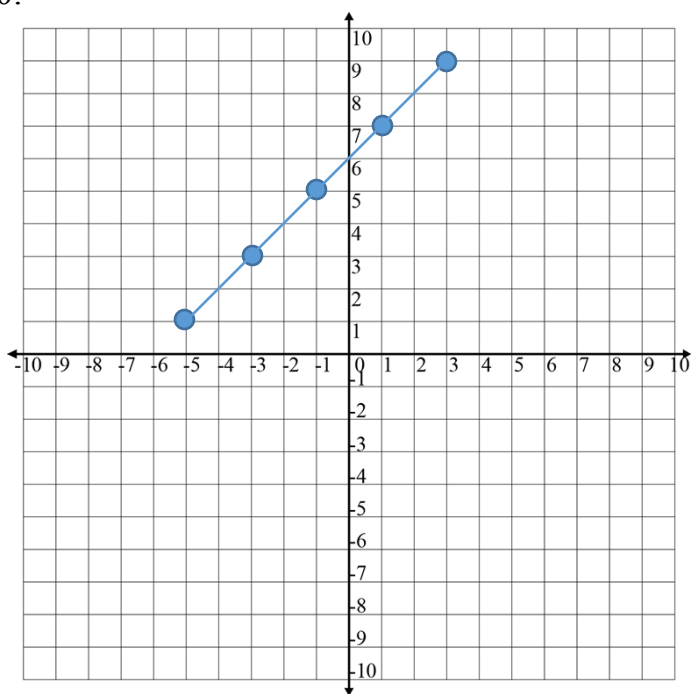
8. $-2y + 3x = 6 - 2y$

Determine if the graph represents a linear function

9.



10.



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PA.A.1.3 Identify a function as linear if it can be expressed in the form $y = mx + b$ or if its graph is a straight line.

Complete the table below.

	m , slope, rate of change	linear function	b , y-intercept
1.	-3		7
2.		$y = 4$	
3.	5		0
4.		$y = 5x - 1$	
5.	0		-9
6.		$y = 7x$	

Solve for y to determine if the equation represents a linear function.

7. $2y + x = -6$

8. $3y + 2x = 14 + 3y$

9. $3y - 9x + 2 = 2$

10. $\frac{2}{3}x - 6y = 12y + \frac{2}{3}x$

Independent Practice (PA.A.1.3)

Name _____

Solve for y to determine if the equation represents a linear function.

11. $6x + 3y = 9$

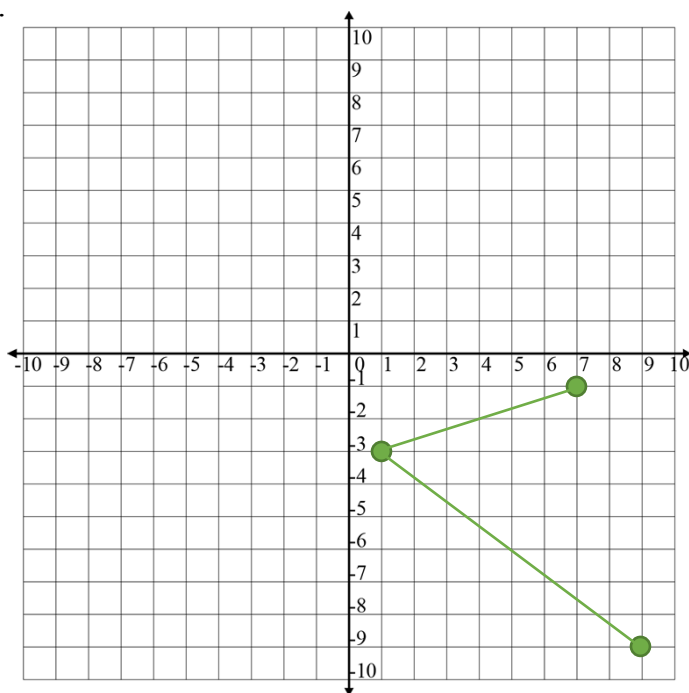
12. $3y - 2x = -2x - 12$

13. $11y + 4x = -8 + 11y$

14. $4x - 3 + 2y = 8x - 9$

Determine if the graph represents a linear function.

15.

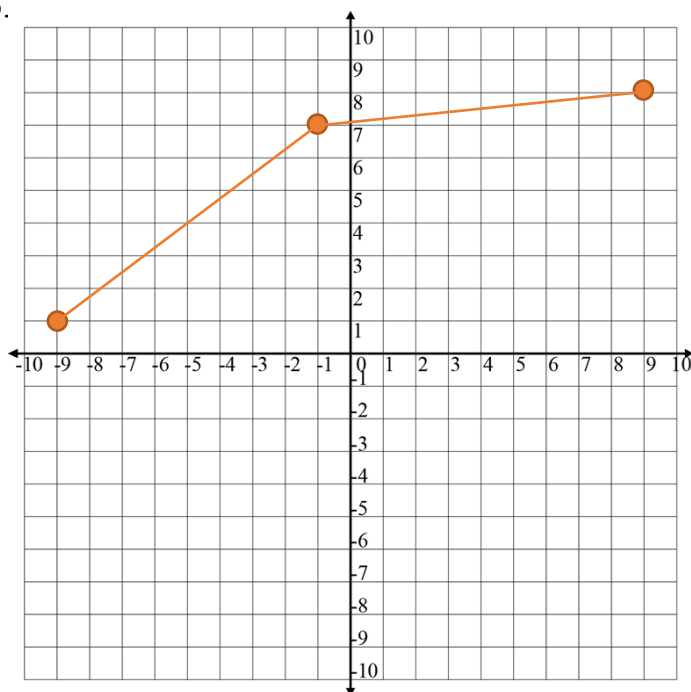


Independent Practice (PA.A.1.3)

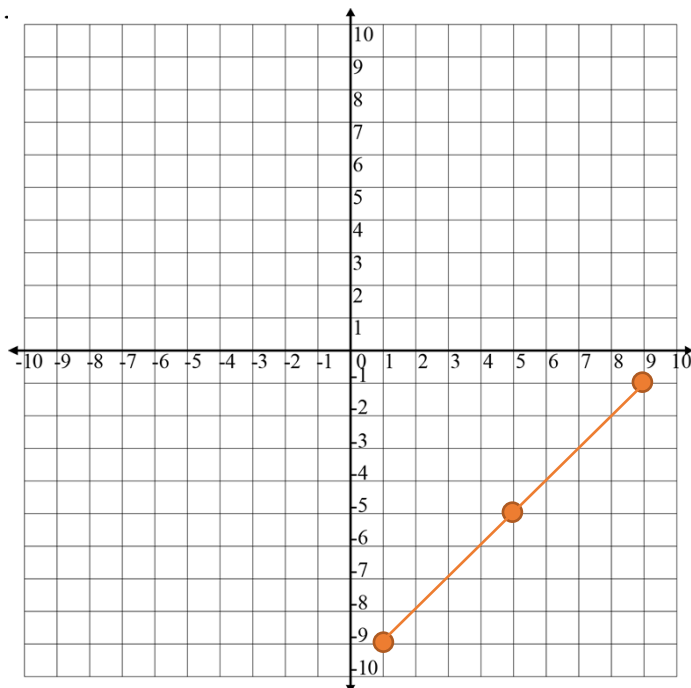
Name _____

Determine if the graph represents a linear function.

16.

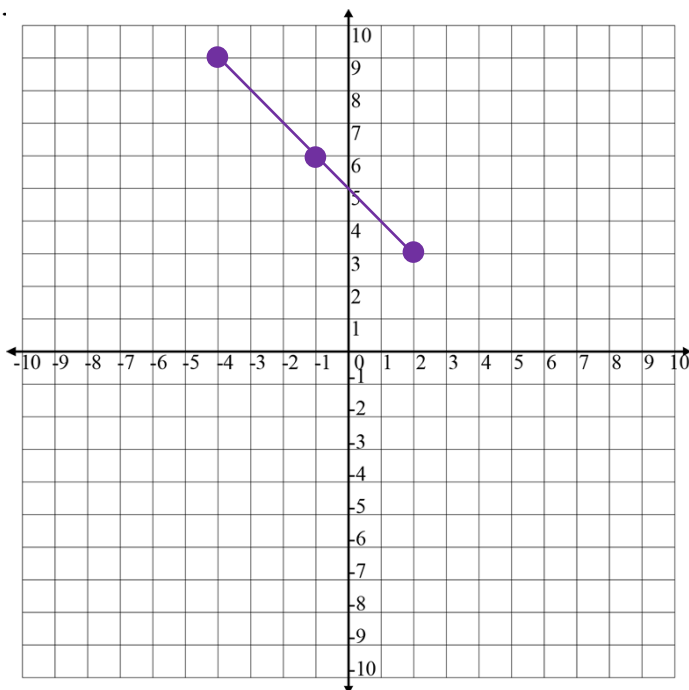


17.



Determine if the graph represents a linear function.

18.



Solve.

19. Ryan and his family spent the day at the OKC Zoo. The total cost for the family to enter the zoo was \$25. The zoo has several exhibits where you can pay \$3 and feed the animals. Write a function that shows the family's cost for the entire visit including animal feedings. Is this function linear?

20. A plumber charges \$45 for a service call to come to your house and \$18 an hour while he is working. Write a function that shows what the plumber charges for repairs. Is this function linear?

Solve and write answer in correct scientific notation.

1. $\frac{(6 \cdot 10^3)(0.2 \cdot 10^{-5})}{(1.5 \cdot 10^2)} =$

Identify each addend or factor as rational or irrational, solve, and identify the sum or product as rational or irrational.

2. $\sqrt{300} \cdot 2 =$

3. $\sqrt{196} - 3.2 =$

*Put these numbers in order **Least to Greatest**.*

4. 3^4 $\sqrt{81}$ 78

Identify the set of ordered pairs as a function or not a function.

5. (3, 5), (4, 5), (-2, 5), (0, 5)

6. (-6, 2), (-6, -2), (6, 2), (6, -2)

Solve.

7. Miranda is going on a trip with her grandparents to Talihina, Oklahoma. They have 154 miles remaining. If her grandfather travels at a constant rate of 70 mph with no stops, how much longer until they arrive? Use $d = rt$. What are the dependent and independent variables?

Solve.

8. You were working on an assignment on your laptop while inside a coffee shop. You ordered a lunch for \$8, and you are getting refills on your iced latte at \$1.50 each. Write a function for the total cost of your bill. Is this function linear? If you had a refill every 45 minutes and stayed for 3 hours, what was the total bill?

9. Angel goes to Alabaster Caverns with his science club. The cost for the tour is \$120 and he can purchase special lanterns at \$6 each. Write a function for the total cost of the tour. Is this function linear? If he purchases 4 lanterns, what would be the total cost for the science club?

10. Medicine Park is celebrating its birthday with a variety of family activities. For \$35 you can purchase an armband that gives you unlimited rides. Several games are available at \$1.50 per game. If a family buys 3 bands, write a function that shows the total cost after playing games. Is this function linear? What would the same family spend if they played 11 games total?

PA.A.2.1 Represent linear functions with tables, verbal descriptions, symbols, and graphs: translate from one representation to another.

Real-World Connections

In the world of math and science, many people must communicate with others to complete a project. This could be two people in the same office or across the world. One person may choose to represent data in a certain way while another person chooses a different way to represent the same data. When it comes to linear functions, there are many different ways to express the same function. A table shows the input (x) and its corresponding output (y). Verbal descriptions may reference a variety of graph attributes, such as slope, intercepts, parallel, or perpendicular. Symbols in this case refer to algebraic equations. These could be in slope-intercept form, standard form, or point-slope form. Graphs are a pictorial representation of a linear function. These graphs are line graphs on the Cartesian Plane.

Vocabulary

linear functions	a function f is linear if it can be written in the form $f(x) = mx + b$
table	mathematical information organized in columns and rows
symbols	symbols and signs are commonly used to represent values, equality, operations, grouping, and mathematical terms
graph	a visual diagram used to represent statistical information or functions and equations

Identify the slope, x -intercept, and y -intercept from the given equation.

1. $y = 2x - 3$

2. $y = 5$

3. $5x - 2y = -10$

4. $x = 4$

Guided Practice (PA.A.2.1)

Name _____

Identify the slope, x-intercept, and y-intercept from the given table.

5.

x	-2	0	2	4
y	4	8	12	16

Create a table to represent the linear function.

6. $-3x + 2y = 12$

x	y

Write a verbal description to represent the linear function.

7. $y = \frac{1}{5}x - 4$

Write a linear function to represent the given points.

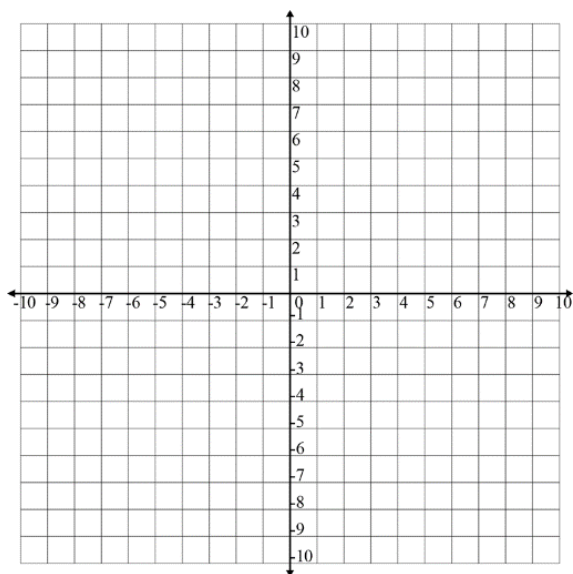
8. (0, 2) and (2, 0)

Guided Practice (PA.A.2.1)

Name _____

Draw the graph that represents the linear function.

9. $4y - x = 12$



Complete the chart below.

	Table	Verbal Description	Symbol(equation)	Graph									
10.	<table><tr><th>Input (x)</th><th>Output (y)</th></tr><tr><td>2</td><td>0</td></tr><tr><td>0</td><td>4</td></tr><tr><td>-2</td><td>8</td></tr></table>		Input (x)	Output (y)	2	0	0	4	-2	8			
			Input (x)	Output (y)									
			2	0									
			0	4									
			-2	8									

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PA.A.2.1 Represent linear functions with tables, verbal descriptions, symbols, and graphs: translate from one representation to another.

Identify the slope, x-intercept, and y-intercept from the given equation.

1. $y = -2x$

2. $y = -3x - 5$

3. $6x - 3y = 12$

4. $x = -3$

5. $x = -2$

6. $y = -8$

7. $y = 3x - 7$

8. $y = -x + 3$

Identify the slope, x-intercept, and y-intercept from the given table.

9.

x	2	4	6	8
y	4	8	12	16

10.

x	-1	0	1	3
y	2	2	2	2

Independent Practice (PA.A.2.1)

Name _____

Create a table to represent the linear function.

11. $-2x + 6y = 6$

x	y

12. $y = \frac{1}{3}x - 4$

x	y

Write a verbal description to represent the linear function.

13. $y = 6x - 2$

14. $-9x + 3y = 18$

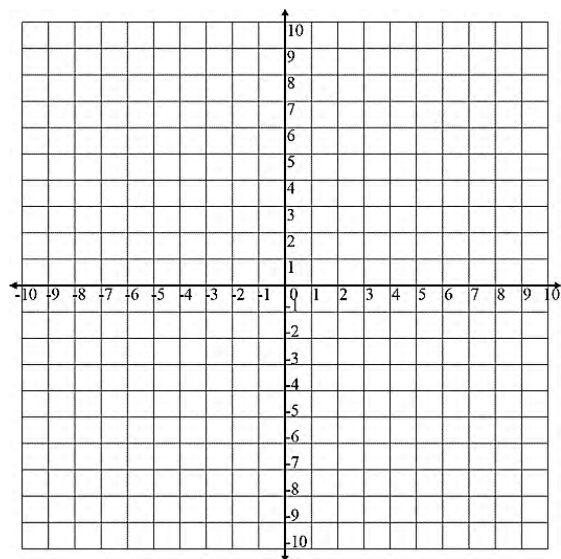
Write a linear function to represent the given points.

15. $(0, -3)$ and $(3, 0)$

16. $(1, 4)$ and $(3, 8)$

Draw the graph that represents the linear function.

17. $y = \frac{2}{3}x + 2$

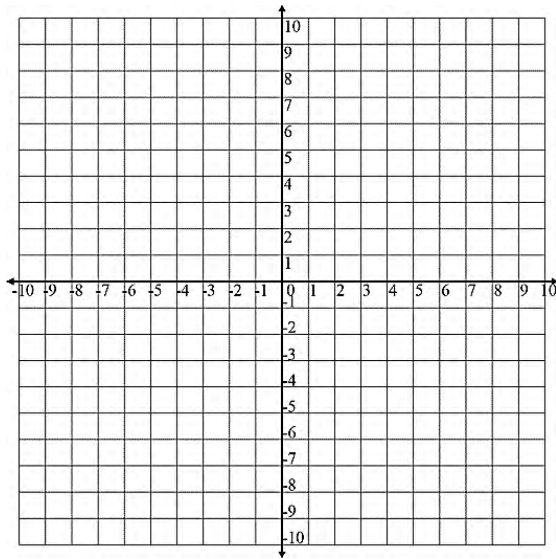


Independent Practice (PA.A.2.1)

Name _____

Draw the graph that represents the linear function.

18. $-6x + 2y = -12$



19. Jessie is paid \$10 per day for trying to get new subscriptions for the local newspaper while walking around the neighborhood. He gets an additional \$1.50 for each new subscription? Create a table that shows his pay if he sells anywhere from 0 to 5 new subscriptions?

20. Patman's Pizza charges a delivery fee of \$4 and \$9 for each large pizza. Simple Simon's Pizza charges a delivery fee of \$10 and \$8 for each large pizza. Write a linear function for each pizza place, graph both equations, give the break-even number, and explain which company you would use?
-

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Solve and write answer in correct scientific notation.

1. $\frac{(0.2 \cdot 10^3)(1.25 \cdot 10^6)}{(2.5 \cdot 10^2)} =$

Identify if the number is a perfect square or not. If it is give the square root, if it is not give the two positive integers that the positive root would fall between.

2. $\sqrt{260}$

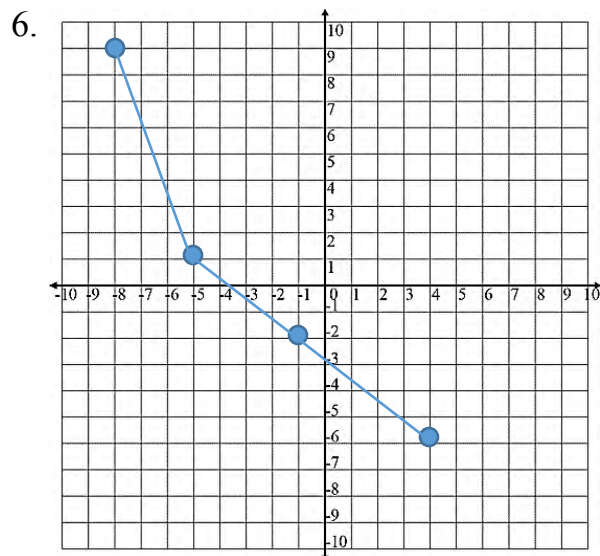
3. $\sqrt{484}$

Identify each number as rational or irrational then put the numbers in order from greatest to least.

4. $\pi, 2^2, \sqrt{20}$

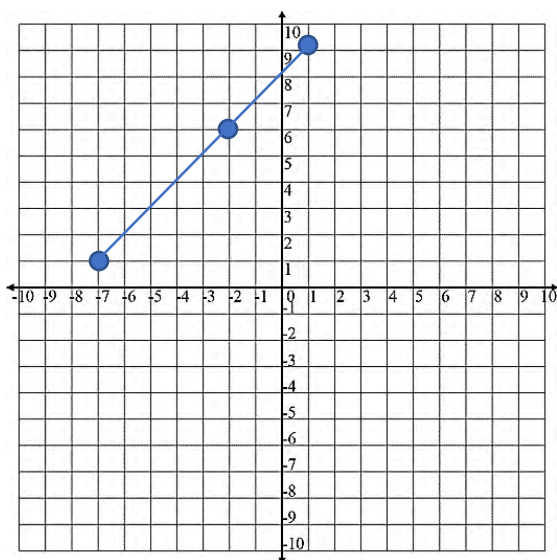
5. $3\pi, 3^2, \sqrt{100}$

Identify the graph as linear or nonlinear.



Identify the graph as linear or nonlinear.

7.



Solve.

8. Seth makes the following table of data about the area of a square and its side length?

Area of a square	1 centimeters ²	9 centimeters ²	25 centimeters ²	49 centimeters ²
Side length	1 centimeter	3 centimeters	5 centimeters	7 centimeters

What is the dependent and independent variable? Is the function linear?

9. Madison is paid \$25 for mowing Mrs. Thomson's grass. She gets an additional \$8 for each tree that she trims? Create a table that shows her pay if she trims anywhere from 0 to 10 trees?

Solve.

10. Ishmael and Savanah both work at car dealership but have different pay contracts. Ishmael receives \$550 per week plus \$75 per car he sells. Savanah receives \$430 per week plus \$115 per car she sells. Write a linear function for each of their weekly salaries, graph both equations, give the break-even number, and explain who has the better contract.
-

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PA.A.2.2 Identify, describe, and analyze linear relationships between two variables.**Real-World Connections**

Linear relationships have a constant rate of change, such as the speed at which an object is traveling. If you know a vehicle is traveling at 25 miles per hour, then you can calculate either the amount of time it would take to travel a given distance or the distance traveled in a given amount of time. Another way to look at the linear relationship is that if given distance traveled and amount of time it took to travel, you can calculate the speed. When analyzing a linear relationship, the dependent variable (distance in the above scenario) is divided by the independent variable (time in the above scenario) to find the constant rate of change (speed in the above scenario).

Vocabulary

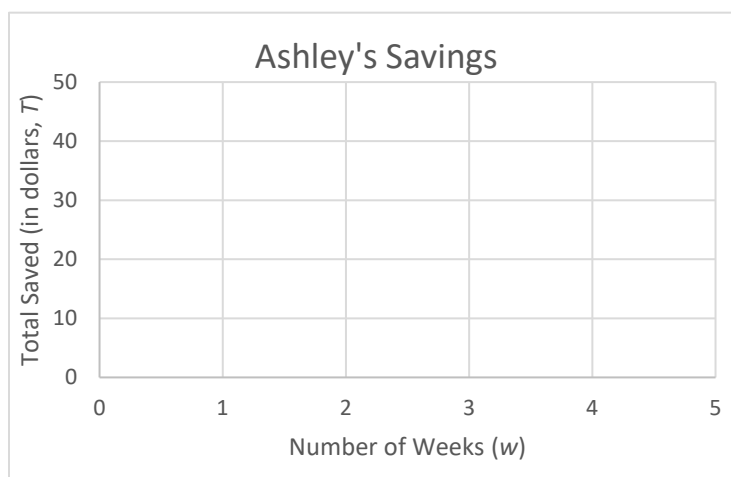
variable a quantity that can change or that may take on different values

Analyze the relationship of the two variables in the given scenario and answer the questions that follow.

Ashley wants to save money for the purchase of a new tablet. The equation $T = 7w + 15$ represents the total amount of money, in dollars, Ashley can save after w weeks.

1. Using the equation, make a table to represent the relationship between the number of weeks and the total amount of money saved, and then graph your data.

Number of Weeks (w)	Total Saved (in dollars, T)



Analyze the relationship of the two variables in the given scenario and answer the questions that follow.

2. What is the dependent and independent variable in this scenario?

3. What does the 15 represent in the given equation?

4. How does the *total amount saved* change in relation to the *number of weeks*?

5. How does the equation show the relationship between the *total amount saved* and the *number of weeks*?

6. How would the equation and graph change if Ashley had \$25 when she began saving?

7. How would the equation and graph change if Ashley were able to save \$10 each week?

Use the following graph to answer questions 8-10.



8. What is the dependent and independent variable in this scenario?

9. Describe the linear relationship between hours 1 and 2.

10. Describe the linear relationship between hours 4 and 5.

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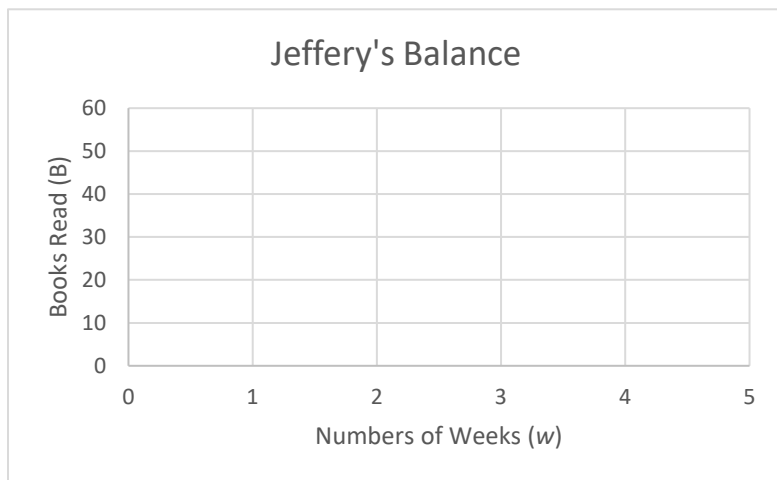
PA.A.2.2 Identify, describe, and analyze linear relationships between two variables.

Analyze the relationship of the two variables in the given scenario and answer the questions that follow

Jeffrey's mom wants to keep track of Jeffrey's account balance for lunch at school. The equation $B = 50 - 10w$ represents the balance, in dollars, Jeffrey has remaining on his account after w weeks.

1. Using the equation, make a table to represent the relationship between the number of weeks and the total amount of money saved, and then graph your data.

Number of Weeks (w)	Account Balance (in dollars, B)



2. What is the dependent and independent variable in this scenario?

3. What does the 50 represent in the given equation?

4. How does the *account balance* change in relation to the *number of weeks*?

Independent Practice (PA.A.2.2)

Name _____

Use the information on the previous page to answer these questions.

5. How does the equation show the relationship between the *account balance* and the *number of weeks*?

6. How would the equation and graph change if Jeffrey's mom made an original deposit of \$100?

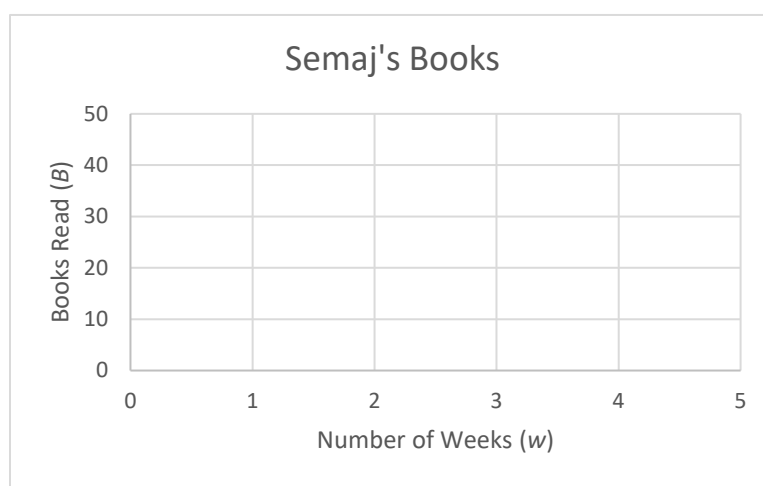
7. How would the equation and graph change if Jeffrey spent \$5 each week?

Analyze the relationship of the two variables in the given scenario and answer the questions that follow.

Mrs. Huskey tells her students to keep track of the books they have read. The equation $B = 5w + 20$ represents the number of books Semaj has read after w weeks.

8. Using the equation, make a table to represent the relationship between the number of weeks and the total amount of money saved, and then graph your data.

Number of Weeks (w)	Books Read (B)



9. What is the dependent and independent variable in this scenario?

10. What does the 20 represent in the given equation?

11. How does the *number of books read* change in relation to the *number of weeks*?

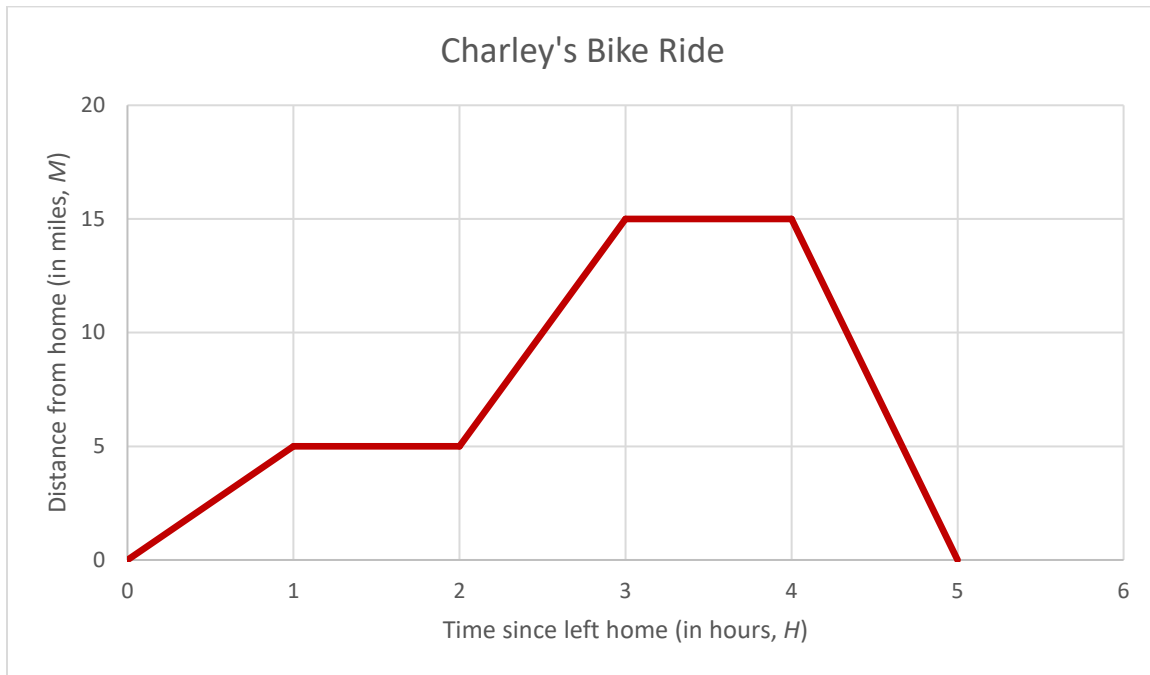
12. How does the equation show the relationship between the *number of books read* and the *number of weeks*?

Use the information on the previous page to answer these questions.

13. How would the equation and graph change if Semaj had only read 15 books when Mrs. Huskey made the assignment?

14. How would the equation and graph change if Semaj read 8 books each week?

Use the following graph to answer questions 15-20.



15. What is the dependent and independent variable in this scenario?

16. Complete the data table based on the graph. Label each row.

	1	2	3	4	5

Independent Practice (PA.A.2.2)

Name _____

Use the graph on the previous page to answer these questions.

17. Describe the linear relationship between hours 1 and 2.

18. Describe the linear relationship between hours 2 and 3.

19. Describe the linear relationship between hours 4 and 5.

20. Does the negative slope in question 19 mean that Charley drove slower than zero miles per hour? Why or why not?

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Write to one power then solve.

1. $\frac{3^4}{3^6} =$

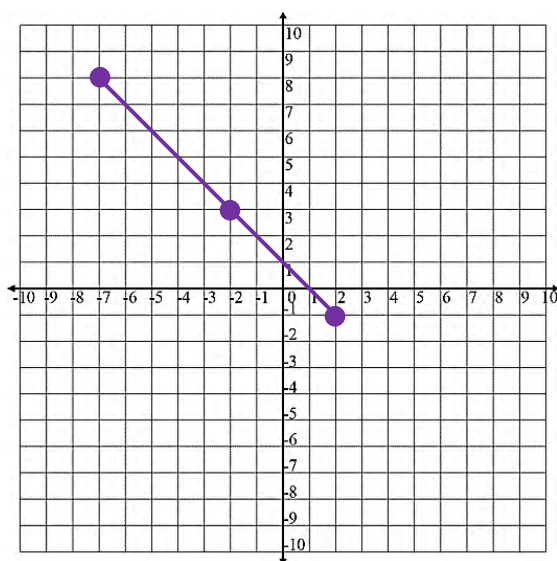
2. $4^{-4} \cdot 4^7 =$

Identify each number as rational or irrational then put the numbers in order from **least to greatest**.

3. $4^2, \sqrt{275}, 5\pi$

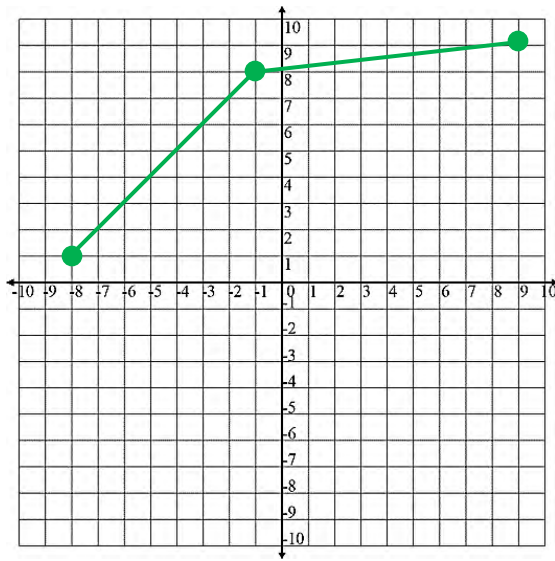
Identify the graph as linear or nonlinear.

4.



Identify the graph as linear or nonlinear

5.

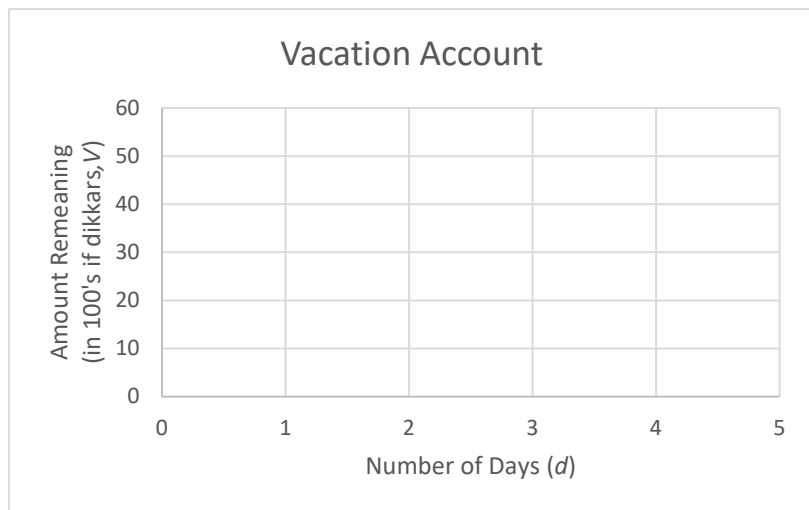


Analyze the relationship of the two variables in the given scenario and answer the questions that follow.

Xavier is going on vacation with his family to Little Sahara. Xavier uses what he learned in math class to write an equation $V = 5,000 - 325d$ that represents the amount left in their vacation account (V) after a certain number of days (d) have passed.

6. Using the equation, make a table to represent the relationship between the number of weeks and the total amount of money saved, and then graph your data.

Number of Days (d)	Amount Remaining in 100's of dollars (V)



Use the information on the previous page to answer these questions.

7. What is the dependent and independent variable in this scenario? What does the 5,000 represent in the given equation?

8. How does the *amount remaining in the account* change in relation to the *number of days*?

9. How does the equation show the relationship between the *amount remaining in the account* and the *number of days*?

10. How would the equation and graph vacation account change if it started with \$3,500? How would the equation and graph change if the daily expenditure was \$275?

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PA.A.2.3 Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the y-intercept is zero when the function represents a proportional relationship.

Real-World Connections

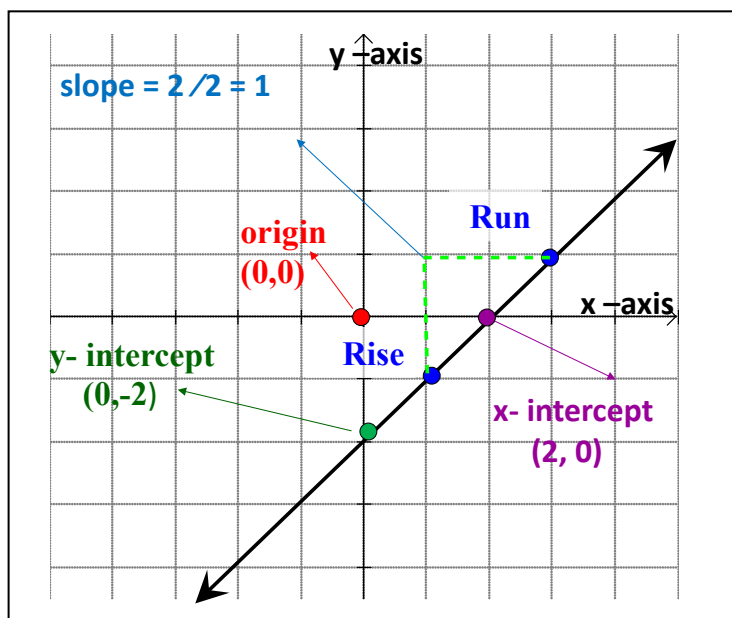
Understanding the properties of a linear function will help you identify a function as linear without needing to graph it. Slope, rate of change, is the change in the dependent variable divided by the change in the independent variable. In a linear relationship, this rate remains unchanged. An example would be if you are 10 miles from shore in a kayak and you paddle at a consistent rate of 20 mph, you have a linear function $f(x)$ or $y = 10 - 20h$ and would reach the shore in 30 minutes. A function can be linear, but not proportional. A proportional relationship is one where substituting 0 for the independent variable results in a dependent variable of 0 as well. An example of a linear function that is proportional would be if Johnny eats 2 hot dog per minute at an eating contest. This is linear $f(x)$ or $y = 2x$. It is also proportional since substituting a 0 for x would also make $y = 0$. If x and $y = 0$, you have the ordered pair $(0, 0)$; therefore, linear functions with a proportional relationship cross at the origin.

Vocabulary

function	a rule that assigns to every element of one set (the domain, x , input) exactly one element of another set (the range, y , output), also called “input/output” rule
linear function	a function that can be written in the form $f(x) = mx + b$
zero	the numeral 0, sometimes used as a place holder, nothing, none, nil, naught
proportional relationship	relationship in which two quantities vary directly with one another, such that if one item is doubled the other is doubled, also known as a direct variation, the equation for a linear function of such a relationship is $y = mx$, and the graph produced crosses through the origin $(0, 0)$, in this equation, m is the slope of the line, also known as the unit rate or the constant of proportionality of the function

Vocabulary

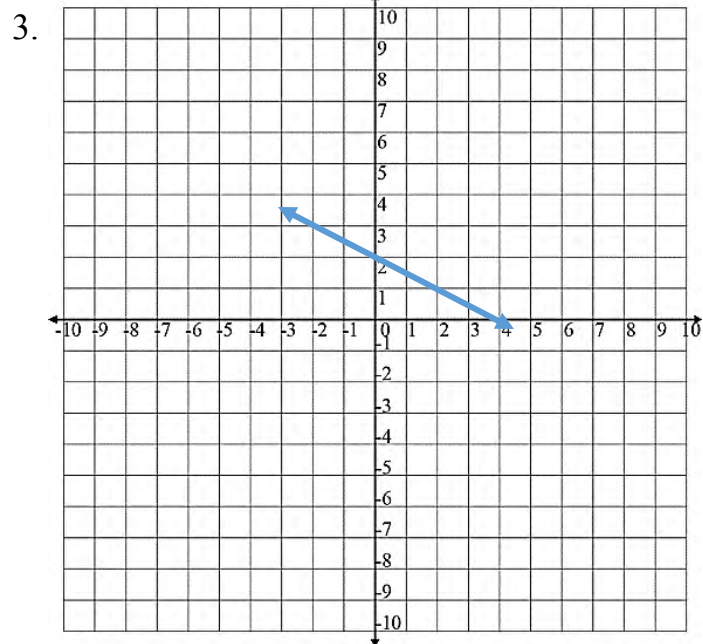
graphical properties (of linear functions)	slope, x-intercept, y-intercept
slope	measure of the steepness of a line in a Cartesian plane, found by determining the constant rate of change in the y-coordinate per 1-unit change in the x-coordinate, $\frac{\Delta y}{\Delta x}$, $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, when in standard form it is $\frac{-A}{B}$, when in slope-intercept form it is m
intercepts	geometrically, where a graph intersects an axis in a Cartesian plane
rate of change	a rate that describes how one quantity changes in relation to another quantity, if x is the independent variable and y is the dependent variable, then rate of change = $\frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$, rates of change can be positive (y increases as x increases) or negative (y decreases as x increases), when a quantity does not change over time, it is called zero rate of change
x-intercept	where the line crosses the x -axis, $y = 0$, when in standard form it is $\frac{C}{A}$
y-intercept	where the line crosses the y -axis, $x = 0$, when in standard form it is $\frac{C}{B}$, when in slope-intercept form it is b
origin	point where the x and y axis meet, $(0, 0)$
x-axis	horizontal axis in the Cartesian plane
y-axis	vertical axis in the Cartesian plane



Identify the slope, the x-intercept, and y-intercept.

1. $y = 7x - 3$

2. $4x - 2y = 8$

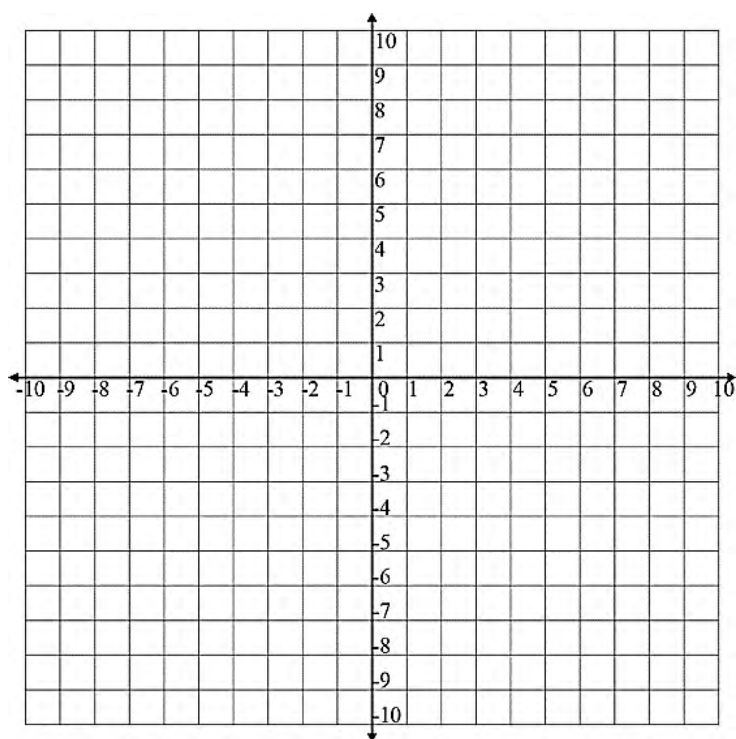


Use the table to answer questions 4 and 5.

Time Driven (h) x	2	4	6
Distance Traveled(miles) y	80	160	240

4. What is the rate of change?

5. Sketch the graph of the function.



Use the given scenario to answer questions 6-10.

Every morning Miguel makes a protein smoothie by putting 2.5 tablespoons of protein powder in a blender with ice and a cup of milk. Sometimes after school, he and his sister have a smoothie before they go to soccer practice, so he puts twice as much protein powder in the blender. If he has friends over and wants to serve protein shakes, he makes a full blender. His recipe is simple, he puts in 2.5 tablespoons of powder for every cup of shake he wants to make.

6. Is this a linear function?

7. What would the equation of the function be?

8. Is it a proportional relationship, why or why not?

9. What is the slope of the function?

10. What are the intercepts of the function?

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PA.A.2.3 Identify graphical properties of linear functions including slope and intercepts. Know that the slope equals the rate of change, and that the y-intercept is zero when the function represents a proportional relationship.

Identify the slope, x-intercept, and y-intercept.

1. $y = \frac{1}{2}x + 5$

2. $y = -4x$

3. $-2x + 3y = 12$

4. $8x + 2y = 12$

5. $y = -\frac{3}{2}x - 3$

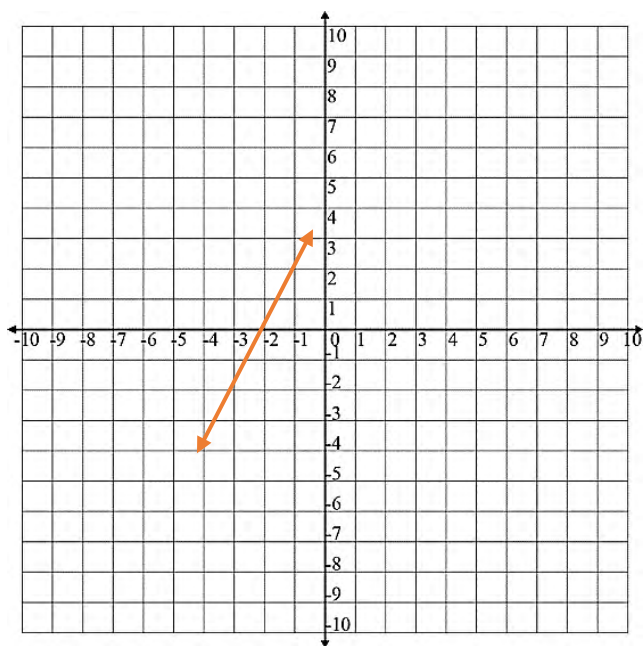
6. $y = 5$

Independent Practice (PA.A.2.3)

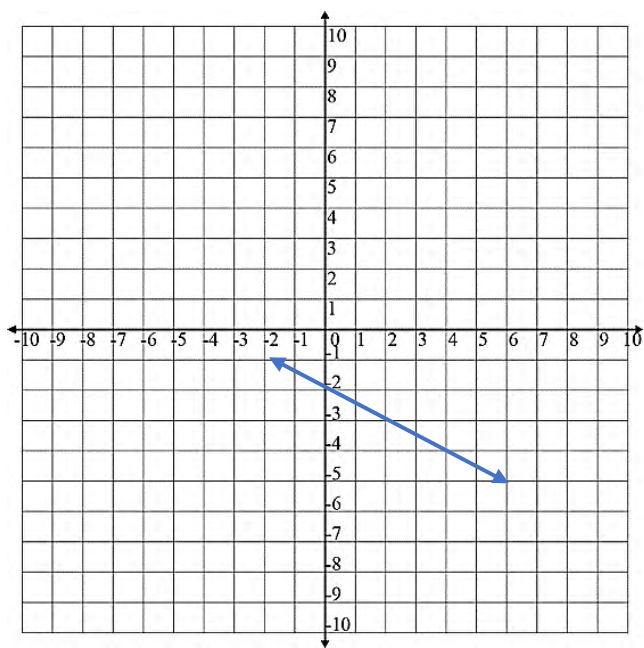
Name _____

Identify the slope, x -intercept, and y -intercept.

7.



8.

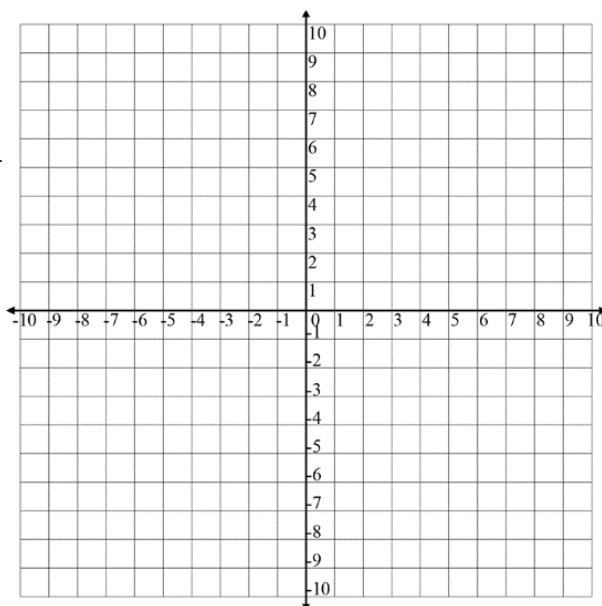


Independent Practice (PA.A.2.3)

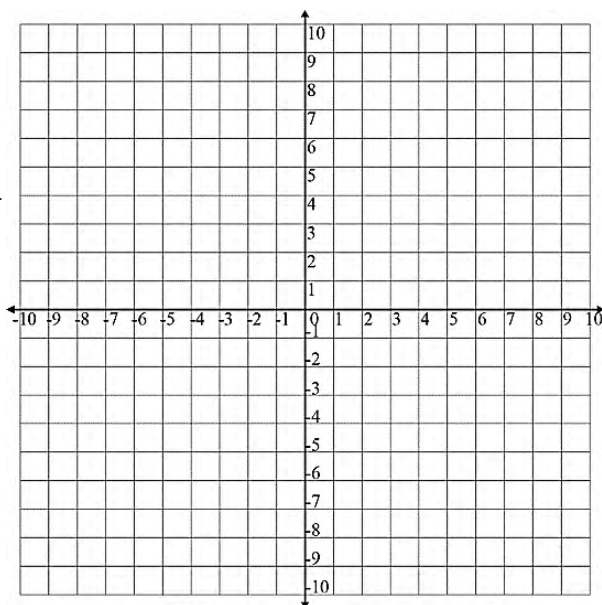
Name _____

Given the slope and intercepts, write and graph the function.

9. $m = -\frac{3}{5}$, x -intercept = -5, y -intercept = -3



10. $m = 4$, x -intercept = -1, y -intercept = 4

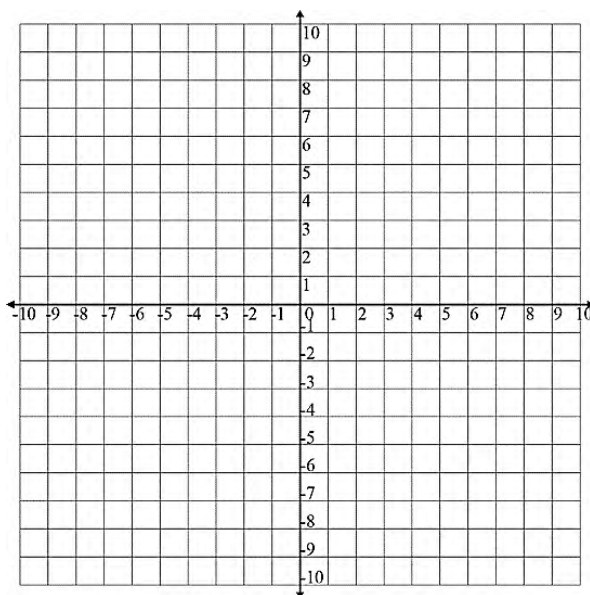


Independent Practice (PA.A.2.3)

Name _____

Given the slope and intercepts, write and graph the function.

11. $m = \frac{2}{3}$, x -intercept = $-\frac{21}{2}$, y -intercept = 7

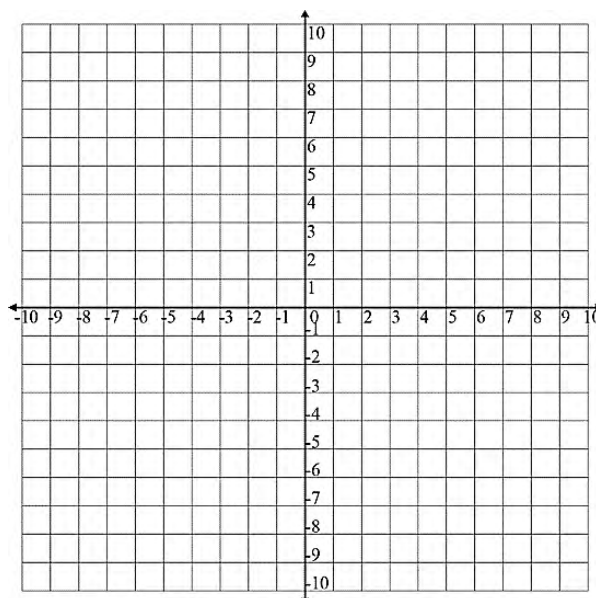


Use the table to answer questions 12 and 13.

Apples Purchased (lb) x	3	6	9
Money Spent (\$) y	\$6.00	\$12.00	\$18.00

12. What is the rate of change?

13. Sketch the graph of the function.



Independent Practice (PA.A.2.3)

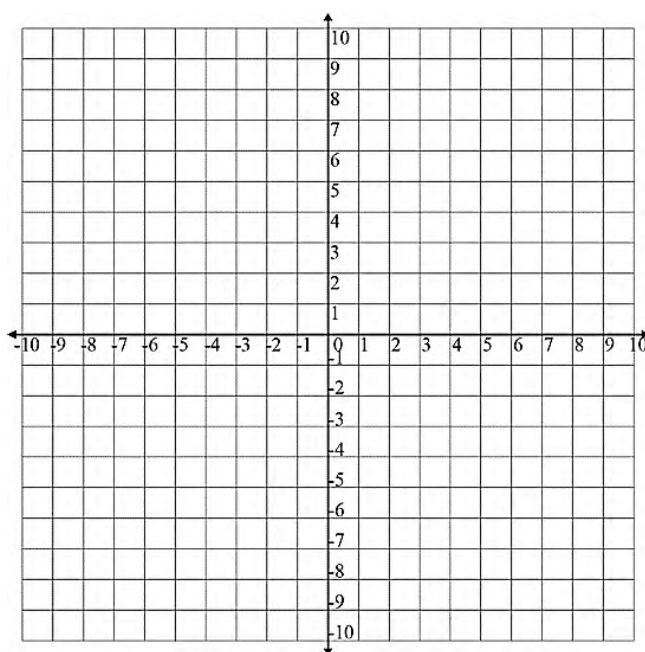
Name _____

Use the table to answer questions 14 and 15.

Newspapers Sold x	20	25	30
Money Earned (\$) y	45.00	56.25	67.50

14. What is the rate of change?

15. Sketch the graph of the function.



Use the given scenario to answer questions 16-20.

Mrs. Snavely makes pancakes every Saturday. She uses 3 cups of flour to make enough pancakes for her husband and herself. Sometimes their two children are home from college, so she must use 6 cups of flour. When the entire family of 14 is at home over holiday weekends, she needs 21 cups of flour.

16. Is this a linear function?

17. What would the equation of the function be?

18. Is it a proportional relationship, why or why not?

19. What is the slope of the function?

20. What are the intercepts of the function?

Write to one power then solve.

1. $\frac{5^6}{5^4} =$

2. $2^3 \cdot 2^{-7} =$

Simplify each radical.

3. $\frac{6}{\sqrt{3}}$

4. $\sqrt{325}$

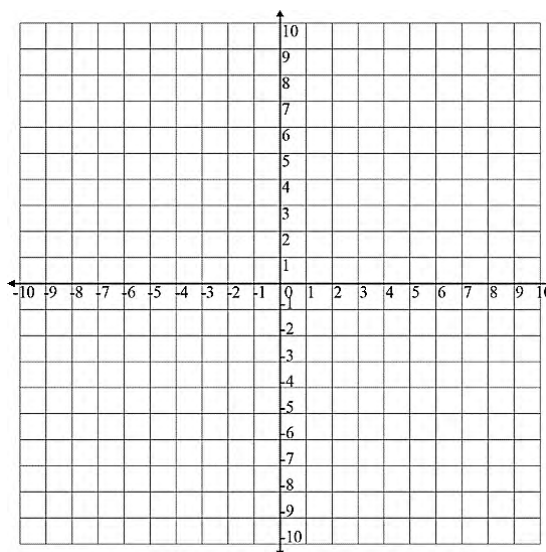
Identify the slope, x-intercept, and y-intercept.

5. $y = -2$

6. $3x - 2y = -12$

Given the slope and intercepts, write and graph the function.

7. $m = -\frac{1}{2}$ x-intercept = -2 y-intercept = -1



Use the data from the table to answer questions 8-10.

Timothy has created a table with the data from two home Wi-Fi companies.

Gigs Used	2	4	6	8
\$ for Forever Data	\$30	\$60	\$90	\$120
\$ for Digital Downloads	\$55	\$75	\$95	\$115

8. Using the data from the table write an equation for each company?

9. Identify each as linear and/or proportional and explain why or why not.

10. Which company has the better deal, defend your answer?

PA.A.2.4 Predict the effect on the graph of a linear function when the slope or y-intercept changes. Use appropriate tools to examine these effects.

Real-World Connections

When determining how much money needed to make a purchase you can adjust the length of time it takes to achieve the amount by either changing the startup amount (y-intercept) or the amount saved each week (slope). When graphing this data, the slope (m) affects the steepness of the graph, and the y-coordinate of the y-intercept (b) affects where the graph crosses the y-axis.

Vocabulary

graph	visual diagram used to represent statistical information or functions and equations
linear function	a function that can be written in the form $f(x) = mx + b$
slope	measure of the steepness of a line in a Cartesian plane, found by determining the constant rate of change in the y-coordinate per 1-unit change in the x-coordinate, $\frac{\Delta y}{\Delta x}$, $\frac{(y_2 - y_1)}{(x_2 - x_1)}$, when in standard form it is $\frac{-A}{B}$, when in slope-intercept form it is m
y-intercept	where the line crosses the y-axis, $x = 0$, when in standard form it is $\frac{C}{B}$, when in slope-intercept form it is b

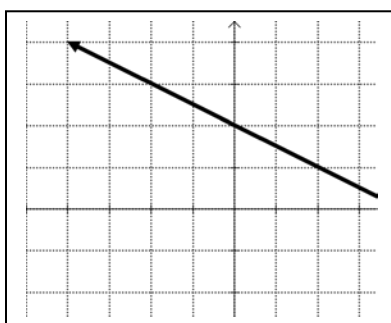
Describe in words the change of the graph of the linear function.

- How would the graph change in the linear function $y = 2x - 3$ if the slope was changed to $\frac{1}{3}$, and the y-intercept remained the same?

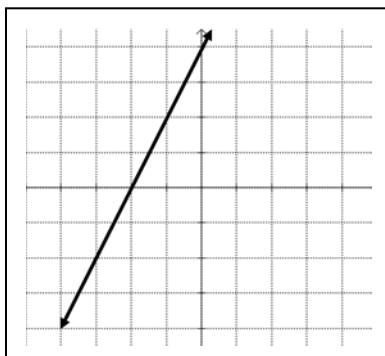
Describe in words the change of the graph of the linear function.

2. How would the graph change in the linear function $y = -\frac{2}{5}x + 2$ if slope remained the same, and the y-intercept was changed to -3?

3. How would the graph below change if the slope was changed to -2 , and the y-intercept remained the same?

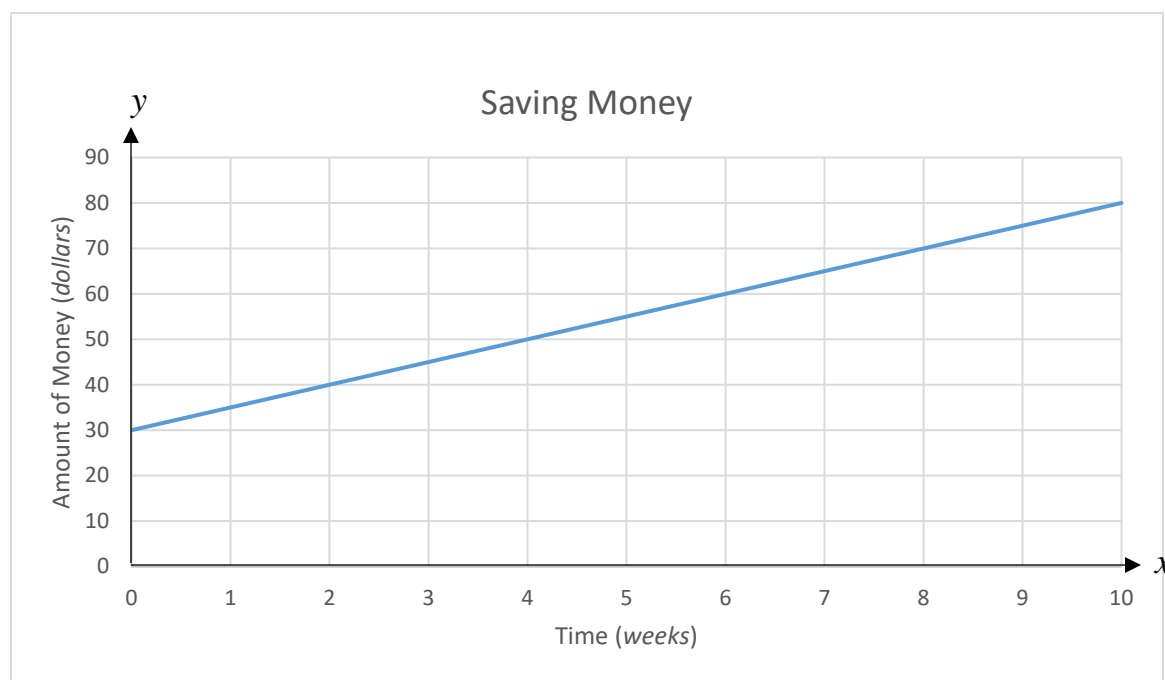


4. How would the graph below change if the slope remained the same, and the y-intercept changed to 7?



Use the given scenario and graph to answer questions 5-10.

Jeffrey received \$30 for mowing his neighbor's yard. He wants to save his money to purchase a new game for his gaming console. He decides to save the \$30 and add \$5 from his allowance each week. The amount of money that he has saved for any given time is shown in the graph below.



5. What is the y-intercept in this situation?

6. What does the y-intercept represent in this situation?

7. What is the slope or rate of change in this situation?

8. What does the slope or rate of change represent in this situation?

Use the given scenario and graph to answer these questions.

Jeffery wants to consider several different savings options as compared to the one shown in the graph on the previous page.

9. How would the graph change if he reduced the amount he started with by \$5?

10. How would the graph change if he doubled the amount he saved each week?

PA.A.2.4 Predict the effect on the graph of a linear function when the slope or y-intercept changes. Use appropriate tools to examine these effects.

Write the revised equation and describe in words the change of the graph of the linear function.

1. $y = -3x + 2$ if the slope was changed to 3, and the y-intercept remained the same?

2. $y = -4x - 3$ if the slope was changed to $-\frac{1}{2}$, and the y-intercept remained the same?

3. $y = x - 5$ if slope remained the same, and the y-intercept was changed to 3?

4. $y = 3x + 7$ if slope remained the same, and the y-intercept was changed to 1?

5. $y = -2x - 5$ if the slope was changed to 2, and the y-intercept remained the same?

Independent Practice (PA.A.2.4)

Name _____

Write the revised equation and describe in words the change of the graph of the linear function.

6. $y = -2x - 3$ if the slope was changed to $-\frac{1}{2}$, and the y-intercept remained the same?

7. $y = x - 2$ if slope remained the same, and the y-intercept was changed to -3?

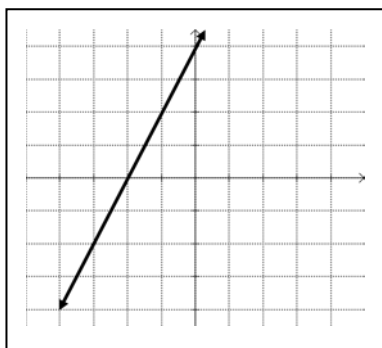
8. $y = -3x + 2$ if slope remained the same, and the y-intercept was changed to -2?

9. $y = -3x + 7$ if slope was changed to -4, and the y-intercept remained the same?

10. $y = -4x - 7$ if slope remained the same, and the y-intercept was changed to -3?

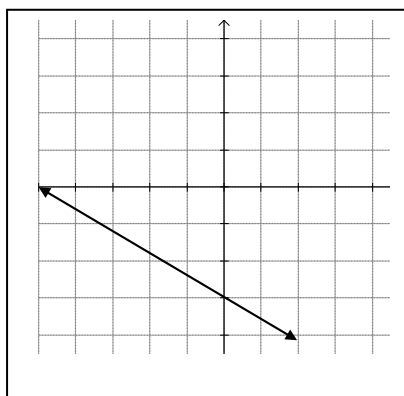
Write the revised equation and describe in words the change of the graph of the linear function.

11. How would the graph below change if the slope was changed to 1, and the y-intercept remained the same?



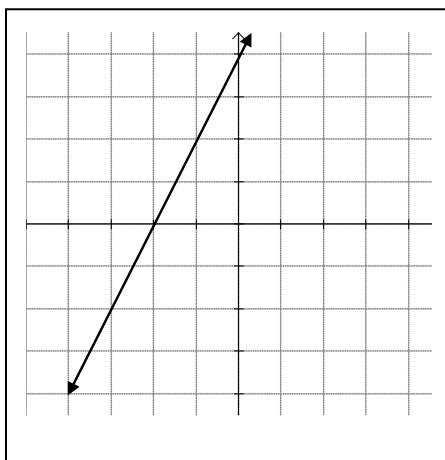
Answer the following questions.

12. How would the graph below change if the slope was changed to $-\frac{1}{2}$, and the y-intercept remained the same?

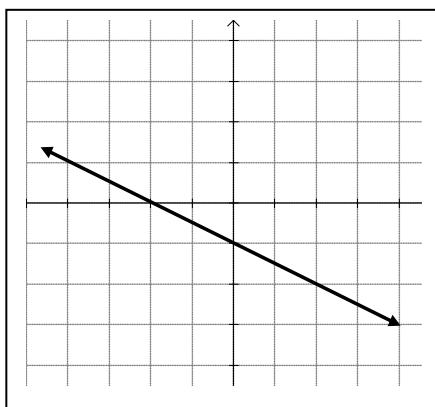


Answer the following questions.

13. How would the graph below change if the slope remained the same, and the y-intercept changed to -4?

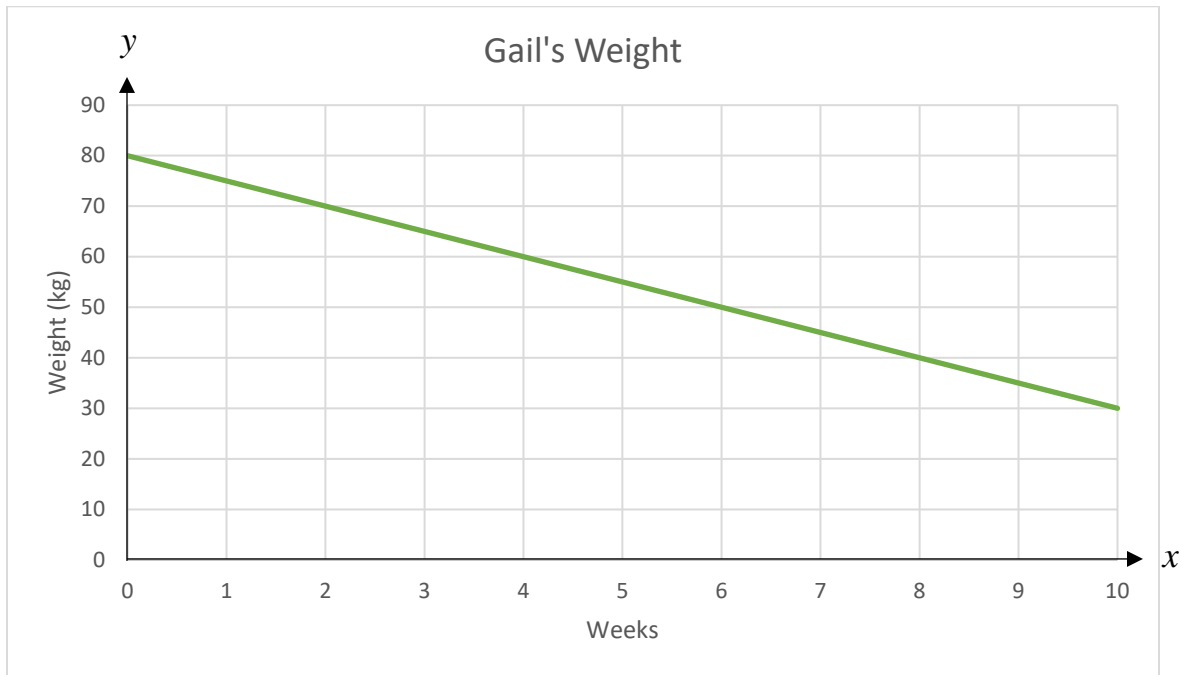


14. How would the graph below change if the slope remained the same, and the y-intercept changed to 0?



Use the given scenario and graph to answer questions 15-18.

Gail wants to drop a weight class in wrestling before the season begins. Her weight for any given time is shown in the graph below.



15. What is the y-intercept in this situation?

16. What does the y-intercept represent in this situation?

17. What is the slope or rate of change in this situation?

18. What does the slope or rate of change represent in this situation?

Independent Practice (PA.A.2.4)

Name _____

Use the given scenario and graph on the previous page to answer questions.

Gail wants to consider a few different weight loss options as compared to the one shown in the graph above.

19. How would the graph change if she reduced the amount she lost each week by 3 kilograms?

20. How would the graph change if she increased the amount she lost each week by 2 kilograms?

Put these number in order from *least* to *greatest*.

1. 2.17×10^{-2} , 4.18×10^{-4} , 3.26×10^{-3}

2. 7.26×10^8 , 6.12×10^{12} , 8.97×10^7

Simplify and identify the solution as rational or irrational.

3. $4\sqrt{5} + 3\sqrt{45}$

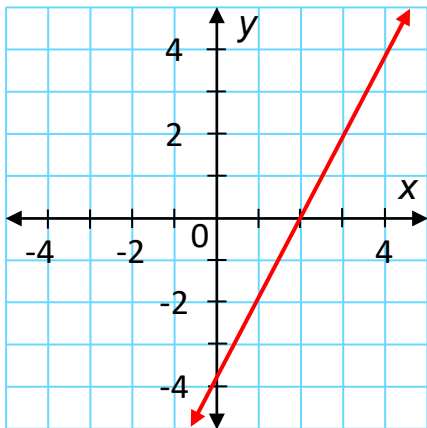
4. $3\sqrt{32} \cdot 6\sqrt{2}$

Write the equation for the linear function and identify the slope and intercepts.

5.

x	-2	-1	0	1	2
y	7	4	1	-2	-5

6.



Use the scenario below to answer questions 7 – 10.

Jill wants to save money to purchase a new mountain bike before the Mount Scott race in October. Her parents gave her \$100 to use toward the bike. The equation $S = 15w + 100$ represents the amount Jill has saved after w weeks, when she saves half of her allowance each week.

7. What is the dependent and independent variable in this scenario? What does the 100 represent in the given equation?

8. How does the *total amount saved* change in relation to the *number of weeks*?

9. How does the equation show the relationship between the *total amount saved* and the *number of weeks*?

10. How would the equation and graph change if Jill had only saved a third of her allowance each week? How would the equation and graph change if Jill's parents had given only her half as much to start with?

PA.A.2.5 Solve problems involving linear functions and interpret results in the original context.**Real-World Connections**

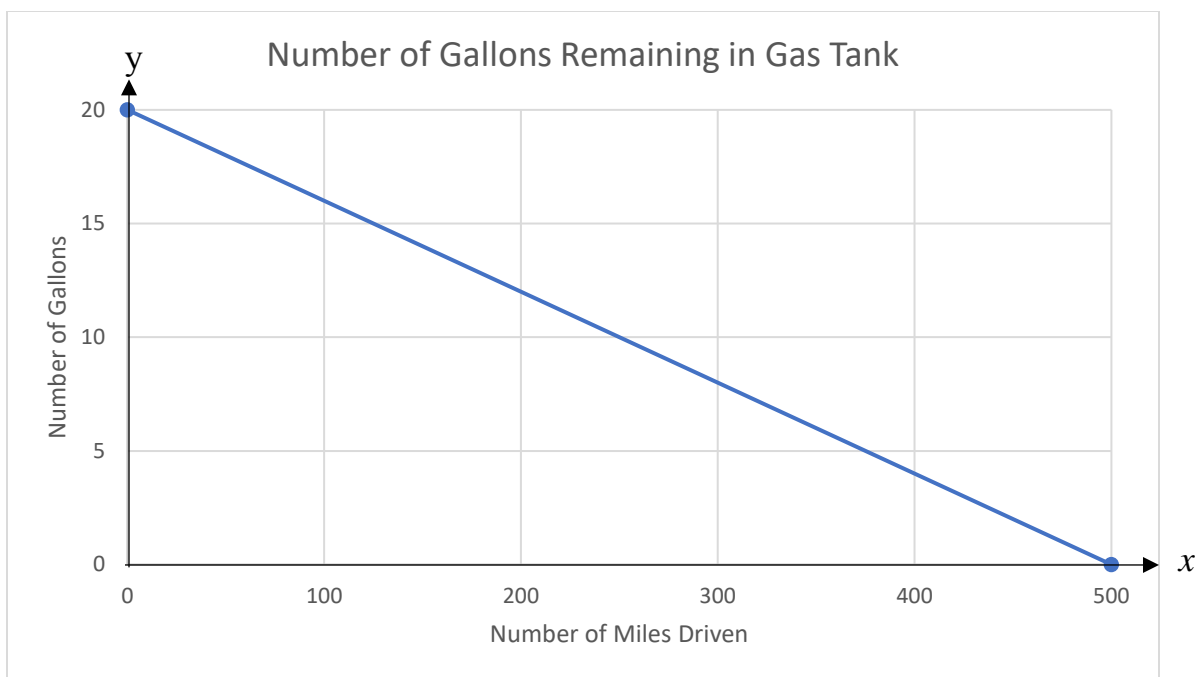
In the real-world linear functions, solving for x or y does not have any real meaning. Today, you will interpret the solutions of linear functions using the original context of the independent and dependent variables. This means if the dependent variable (y) was the total cost of 4 pounds of cherries at \$1.25 per pound. The answer would not be given as $y = 5$ but rather \$5. Likewise, if the dependent variable (y) was distance traveled in miles and the independent variable (x) was time traveled in hours, the answer would not be given as y per x , but rather mph.

Vocabulary

linear function a function that can be written in the form $f(x) = mx + b$

Use the given scenario to answer questions about linear functions.

A car owner recorded the number of gallons of gas remaining in the car's gas tank after driving many miles.



Use the graph on the previous page to answer the following questions.

1. What does the x -intercept represent on the graph?

2. What does the y -intercept represent on the graph?

3. What is the relationship between the *number of gallons in the tank* to the *number of miles driven*?

4. What is the rate of change?

5. What would the point (400, 10) represent on the graph?

6. Is the point a solution of the graph?

7. Based on the answer to problem 6, answer why or why not. Defend your answer using properties of the graph of the linear function as well as mathematically.

Use the graph on the first page of the Guided Practice to answer the following questions.

8. How many gallons of gas would be in the tank after driving 250 miles?

9. The owner of the car can increase the miles per gallon by 3 miles if they use super unleaded. What would the rate of change be if the gas was changed?

10. How far could the car go on 5 gallons of super unleaded fuel?

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PA.A.2.5 Solve problems involving linear functions and interpret results in the original context.

Use the given scenario to answer questions about linear functions.

Central Middle School needs to order new football jerseys. The table below shows the cost of jerseys from Global Graphics with the initial setup cost of \$10.

Global Graphics

# of Jerseys	10	20	30	40
Total Cost (\$)	\$70	\$130	\$190	\$250

1. What is the independent variable?

2. What is the dependent variable?

3. What is the relationship between the *total cost* to the *number of jerseys*?

4. What is the rate of change?

5. Write a linear function to represent the total cost (y)?

6. Based on the data in the Global Graphic's table, what would 150 jerseys cost?

Independent Practice (PA.A.2.5)

Name _____

Use the given scenario to answer questions about linear functions.

The table below shows the cost of jerseys from Dynamite Designs with the initial setup cost of \$40.

Dynamite Designs

# of Jerseys	10	20	30	40
Total cost (\$)	\$90	\$140	\$190	\$240

7. What is the independent variable?

8. What is the dependent variable?

9. What is the relationship between the *total cost* to the *number of jerseys*?

10. What is the rate of change?

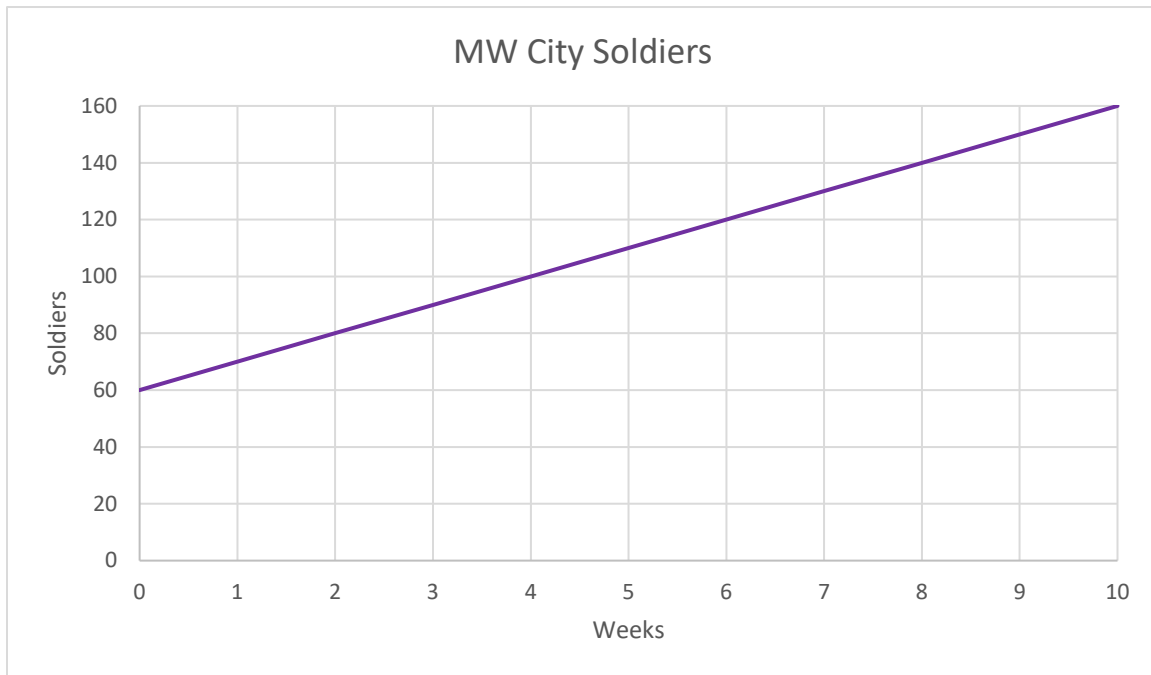
11. Write a linear function to represent the total cost (y).

12. Based on the data in the Dynamite Design's table, what would 150 jerseys cost?

13. Comparing the two tables, which company has the better buy? Defend your answer with data.

Use the scenario and graph below to answer questions 14-20.

A recruiting officer set a goal for new soldiers recruited from his Midwest City office. He created a graph to show the total number of soldiers in the regiment to include soldiers in the regiment before he took over the office, if he meets his goal.



14. What is the independent variable?

15. What is the dependent variable?

16. How do the variables relate to one another?

17. What is the rate of change?

Independent Practice (PA.A.2.5)

Name _____

Use the scenario and graph on the previous page to answer questions 18-20.

18. What is the y-intercept?

19. What does the y-intercept represent?

20. If he meets his goal, how many soldiers will be in the Midwest City regiment on his first anniversary?

Write in scientific notation.

1. $21,700,000,000,000 =$

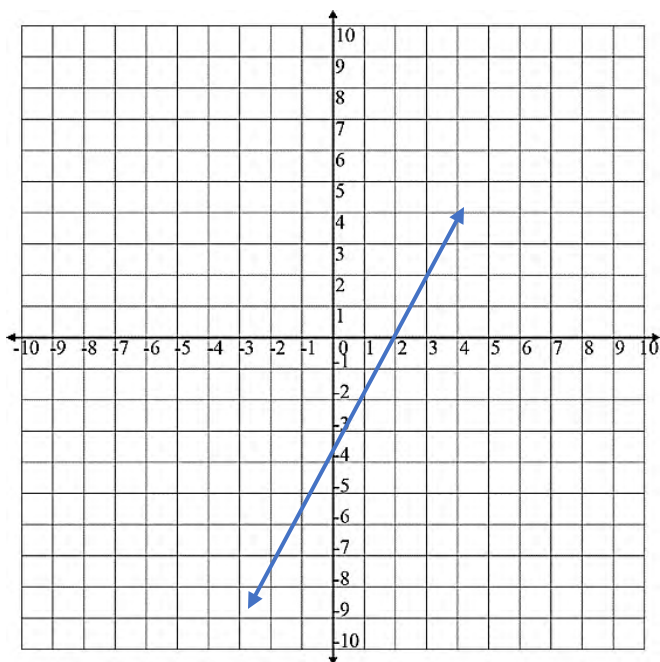
2. $0.000000034 =$

Solve and identify as rational or irrational.

3. $\sqrt{25} \cdot \pi =$

Write the new equation and describe in words the change to the graph if the slope was changed to $\frac{1}{2}$.

4.



Identify each data set as a function or not, as linear or nonlinear, and as proportional or not proportional. Explain why or why not.

5. A cell phone company charges a monthly fee of \$50 for 300 minutes. Each additional minute costs \$0.05.

6. (2, 8); (0, 7); (2, 6); (4, 5)

- 7.

Input	Output
10	2
5	1
0	0
-5	-1

Use the scenario below to answer questions 8-9.

Josh and Hannah are twins, and each receive an allowance of \$20 a week. They both received \$100 from their grandparents for their birthday. Josh and Hannah want to save money for a rafting trip down the Illinois River over Spring Break. Josh decides to put up all his birthday money and add half of his allowance each week to his savings. Hannah wants to get a new tennis racket for \$50 and save the rest. She adds 75% of her allowance each week to her savings.

8. Write a linear function to represent each of their savings. After how many weeks will they have the same amount in savings?

9. If the trip costs \$250, how long will it take each of them to have the money?

Solve.

10. Four families traveled from different parts of Oklahoma to go to a reunion. Jan drove 150 miles at 60 mph, Fred drove 120 miles at 75 mph, and Ralph drove 160 miles at 70 mph. Put the drivers in order from **least** travel time to **greatest** travel time.

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PA.D.1.1 Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine the impact.

Real-World Connections

Although there are several measures of central tendency, the measure that seems to be the most important to students is mean. This is because mean is just another way to say average. The mean or average of a data set is calculated by adding all of the values in the set and dividing by the number of values in the set. Another common measure often used is the median, or center data point when values are sorted in ascending or descending order. When recording grades for a class, a teacher often uses a spreadsheet on a computer. Each grade is in an individual cell arranged in columns (each assignment) and rows (each student's grade).

Vocabulary

calculator	electronic device used for making mathematical calculations
data	a collection of information gathered by observation, questioning, or measurements often organized in graphs or charts
data point	element in a data set
data set	separate elements of related data
delete	remove
insert	add to a set
mean	measure of center in a set of numerical data, computed by adding the values in the set and dividing by the number of values in the set
median	measure of center in a set of numerical data that appears at the center of the sorted data set when an odd number of values are in the set or the mean of the two center data points when the data set has an even number of values
spreadsheet	displays a table of data points entered into cells arranged in columns and rows

Guided Practice (PA.D.1.1)

Name: _____

Complete the following problems.

Use the following data set to answer questions 1-4.

10, 9, 11, 8, 15, 18, 13

1. Calculate the mean, median, and mode. Round to the nearest tenth.

2. Predict how the median will change if a 21 is added to the data set. Identify the new median.

3. Predict how the mean will change if a 4 is added to the data set. Calculate the new mean.

4. Is it possible to add a data point that is less than the mean and have the mean increase? Use math terminology to defend your answer.

Complete the following problems.

Use the following data set to answer questions 5-8:

10, 12, 38, 23, 38, 23, 21

5. Calculate the mean, median, and mode. Round the nearest tenth.

Complete the following problems.

Use the following data set to answer questions 6-8:

10, 12, 38, 23, 38, 23, 21

6. Predict how the median will change if a 19 is added to the data set. Identify the new median.

7. Predict how the mean will change if the 12 is deleted from the data set. Calculate the new mean.

8. Is it possible to add a data point that is less than the median and have the mean increase? Use math terminology to defend your answer.

Solve.

9. The mean weight of five Oklahoma State University middle weight wrestlers is 157 pounds. The weights of four of the wrestlers are 152.6 pounds, 162.3 pounds, 155 pounds, and 148.7 pounds respectively. What is the weight of the fifth wrestler?

10. A set of four numbers that begins with the number 32 is arranged from smallest to largest. If the median is 35, which of the following could possibly be the set of numbers?

- A 32, 32, 36, 38
- B 32, 35, 38, 41
- C 32, 34, 36, 38
- D 32, 36, 40, 44

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PA.D.1.1 Describe the impact that inserting or deleting a data point has on the mean and the median of a data set. Know how to create data displays using a spreadsheet and use a calculator to examine the impact.

Complete the following problems.

Use the following data set to answer questions 1-8:

13, 19, 7, 12, 21, 18, 15

1. Calculate the median. Round to the nearest tenth.

2. Calculate the mean. Round to the nearest tenth.

3. Calculate the mode. Round to the nearest tenth.

4. Predict how the median will change if a 7 is added to the data set. Identify the new median. Round to the nearest tenth.

5. Predict how the mean will change if an 11 is added to the data set. Identify the new mean. Round to the nearest tenth.

6. Predict how the mean will change if a 23 is added to the data set. Calculate the new mean. Round to the nearest tenth.

7. Predict how the median will change if a 19 is added to the data set. Calculate the new median. Round to the nearest tenth.

Complete the following problems:

Use the following data set to answer question 8:

13, 19, 7, 12, 21, 18, 15

8. Predict how the mean will change if the 7 is deleted from the data set. Calculate the new mean. Round to the nearest tenth.

Use the following data set to answer questions 9-16:

11, 18, 8, 15, 24, 14

9. Identify the median. Round to the nearest tenth.

10. Calculate the mean. Round to the nearest tenth.

11. Calculate the mode. Round to the nearest tenth.

12. Predict how the median will change if a 21 is added to the data set. Identify the new median.

13. Predict how the mean will change if an 18 is added to the data set. Calculate the new mean.

14. Predict how the median will change if a 6 is added to the data set. Identify the new median.

Complete the following problems:

Use the following data set to answer questions 15 - 16:

11, 18, 8, 15, 24, 14

15. Predict how the mean will change if a 12 is added to the data set. Calculate the new mean.

16. Predict how the median will change if the 8 is deleted from the data set. Identify the new median.

Solve.

17. Ten students from Cordell Middle School competed in a math competition at SWOSU in Weatherford. The scores obtained by them were recorded as follows:
11, 6, 7, 13, 1, 13, 16, 7, 13, 16

What was the mean, median, and mode of their scores? Round to the nearest tenth.

18. The Cordell Math Coach places an ad in the paper. Which measure of central tendency should she use when writing the article? Defend your answer.

19. Jimmy had an average of 88 on his weekly mathematics tests for the first 5 weeks. What would he need to make in the 6th week to have an average of 90?

20. The first seven runners on the Ardmore Tiger cross country team had an average time of 14.6 minutes. To make the state meet they need an average of 13.8, what time must the last runner have for the team to qualify?

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Complete the following problems:

1. Create a table that represents the linear equation $y = 2x + 1$.
2. Jill received \$150 on her birthday. She gets a weekly allowance of \$10. She uses the equation $S = 10x + 150$ to calculate how much money she will have saved in a given number of weeks. What is the relationship between the number of weeks and the total saved?

-
3. Identify the slope (m) and the y-intercept (b) in the equation $y = -3x + 7$.

-
4. What value of x makes the equation $3x + 4 = 4x - 1$ true?

-
5. The Mangum Public School Professional Development Committee is planning the schedule for the next school year. They would like to send teachers to a summer training on mentor groups. The advance payment for the training is \$1,250 to send as many teachers as you want. The cost at registration is \$175 per teacher. The school board paid \$1,250 for early registration. How many teachers must attend for this to be a good decision?

Write the new equation and give a verbal description of the new line.

6. $y = 3x + 2$ if the slope remains the same, and the y intercept becomes -2.

Complete the following problems.

7. Calculate the volume of a right cylinder with a base area of $21.23 \text{ centimeters}^2$ and a height of 3.2 centimeters to the nearest hundredth of a centimeters³.

8. Use the following data set to answer the question.

23, 18, 31, 46, 7, 15, 13

If the median of a data set is 18 and you add 16, what will happen to the median?

9. The average score for the Oklahoma City Blazers after the first 8 games of the season was 5. Is it reasonable to predict that their new average after game 9 would be 7? Use math terminology to defend your answer.

10. Janice averaged 33 points a game for the first 4 games. Is it reasonable to predict that her average after 5 games would be 35?

PA.D.1.2 Explain how outliers affect measure of central tendency.**Real-World Connections**

Have you ever had a good average (mean) in a class then failed an assignment, and your average dropped significantly? That is because the new grade is significantly different from the other grades in your data set. The number is known as an outlier, which can skew or drastically change some measures of central tendency for the data set. The mean and range are the measures that are most often affected. While median and mode rarely have much change due to an outlier. For this reason, outliers are often removed from a data set before the measures of central tendency are calculated.

Vocabulary

central tendency	typical value for the probability distribution, the most common measures of central tendency are mean (average), median (middle data point), and mode (data point that occurs most often)
outliers	data point that is far outside a representative range of the data set

Complete the following problems.

1. Identify the outlier in the following data set:

16, 25, 28, 24, 26, 26, 25

2. Explain why an outlier can drastically change the mean and range of a data set.

3. Explain why an outlier has little to no effect on the median and mode of a data set.

Use the following data set to answer questions 4 and 5.

29, 29, 8, 27, 28, 26

4. Calculate the mean with and without the outlier.

5. Calculate the median with and without the outlier.

Solve.

Use the following data set to answer questions 6-10.

92, 88, 96, 108, 101, 89, 94

6. Identify the minimum.

7. Identify the maximum.

8. Identify the median.

9. Identify the 1st and 3rd quartiles.

10. Draw a box and whisker plot to represent the data set.

PA.D.1.2 Explain how outliers affect measure of central tendency.

Identify the statements in questions 1-3 as true or false. If false, rewrite the statement so that it is true.

1. An outlier is a number that is far outside the representative range of a data set.

2. The measure of central tendency that is affected the most by an outlier is the mode.

3. The measure of central tendency that is affected the least by an outlier is the mean.

4. Identify the outlier in the following data set:
38, 19, 36, 98, 22

Use the following data set to answer questions 5-8.

12, 18, 16, 15, 16, 31, 12, 16

5. Identify the outlier in the data set.

6. Calculate the mean, median, mode, and range from the data set.

7. Calculate the mean, median, mode, and range from the data set without the outlier.

Independent Practice (PA.D.1.2)

Name: _____

*Use the following data set to answer question 8.***12,18,16,15,16,31,12,16**

8. Using mathematical terminology, explain why some of the measures of central tendency changed more than others.

Solve.

9. Adrianna is on the varsity basketball team. Her points per game are listed in the following table.

Game	1	2	3	4
Points Scored	35	25	22	35

If Adrianna wanted to make her points scored per basketball game appear to be the highest possible, which measure of central tendency would she use? Why?

10. Jeff has recently joined the cross-country team. His times from the first 5 meets are listed in the following table.

Meet	1	2	3	4	5
Time	10 min 18 sec	9 min 53 sec	10 min 11 sec	9 min 48 sec	10 min 8 sec

If Jeff wanted to make his time appear to be the lowest possible, which measure of central tendency would he use? Why?

Independent Practice (PA.D.1.2)

Name: _____

Use the following data set to answer questions 11-15.

48, 56, 36, 54, 51

11. Identify the minimum.

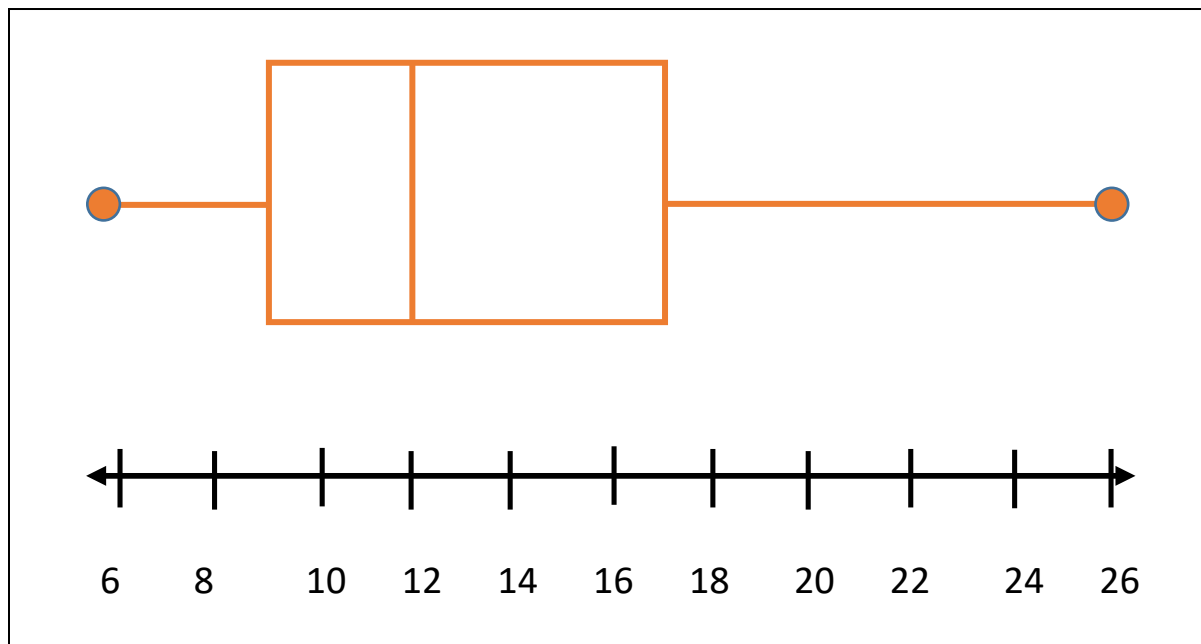
12. Identify the maximum.

13. Identify the median.

14. Identify the 1st and 3rd quartiles.

15. Draw a box and whisker plot to represent the data set.

Use the following box-and-whisker plot to answer questions 16-20.



16. Which data set is represented in the plot?

- A 6, 9, 10, 15, 17, 19, 26
- B 6, 9, 10, 12, 15, 17, 26
- C 6, 10, 11, 12, 15, 17, 26
- D 6, 9, 10, 12, 17, 19, 26

17. Identify the minimum.

18. Identify the maximum.

19. Identify the median.

20. Identify the 1st and 3rd quartiles.

Complete the following problems.

1. Solve for y and identify the function as linear or nonlinear: $-3x + 5y = 15$.

2.

Simplify	Justify
$3(2 + 5) \div 7 + 1$	Given

3. Solve and graph: $2x - 3 \leq 9$.

Identify as a function or not a function.

4. $(1, 2), (2, 4), (3, 5)$

Identify the items that match the given linear function.

5. $y = 2x - 3$

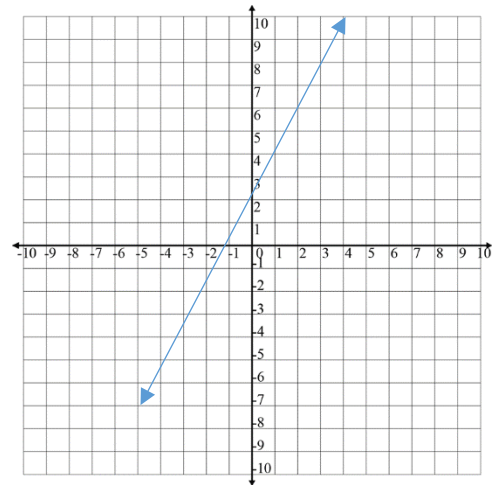
A

x	-2	-1	0	1	2
y	-7	-5	-3	-1	1

B $2x + y = 3$

C Twice a number less than 3

D



Identify as linear or nonlinear.

6. $2x - 3y = 18$

7. If the mean of a data set is 12 and you add 16, what will happen to the mean?

Use the following data set to answer questions 8-10.

32, 38, 36, 35, 36, 11, 32, 31

8. Identify the outlier in the data set.

9. Calculate the mean, median, mode, and range from the data set.

Use the following data set to answer question 10.

32, 38, 36, 35, 36, 11, 32, 31

10. Calculate the mean, median, mode, and range from the data set without the outlier.

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PA.D.1.3 Collect, display, and interpret data using scatter plots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels, and units.

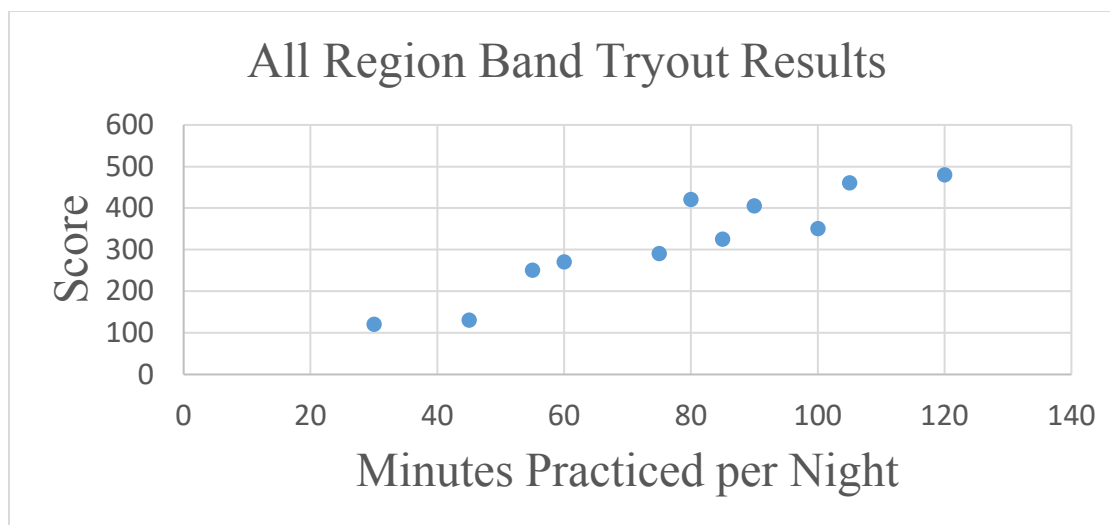
Real-World Connections

Have you tried to make a prediction about something? Maybe you tried to predict the weather tomorrow, or who might win the football game this week. If so, you based that prediction on information or data. Scatter plots are a good way to display two-variable data, which is data that contains only two variables, and make predictions based on that data. In general, the independent variable, the one that is not affected by anything else, is on the x -axis; and the dependent variable, the one that is affected by the independent variable, is plotted on the y -axis.

Vocabulary

average	a number expressing the central or typical value in a set of data, in particular the mode, median, or most commonly the mean, which is found by dividing the sum of the values in the set by the number of values in the set
data	collection of information
estimate	make an approximate calculation
interpret	explain the meaning of information
label	term identifying the data on the axis
line of best fit	straight line drawn through the center of a group of data points plotted on a scatter plot
predictions	what is believed to be most likely based on data
rate of change	ratio between the change in the dependent variable relative to the corresponding change in the independent variable
scatterplots	graph in the coordinate plane representing data from two variables
title	term that defines what the graphic, in this case scatterplot, is representing

Use the scatterplot to answer questions 1-6.



1. What does the shape of the scatterplot tell you about the students that auditioned for all region?

2. What is the average rate of change?

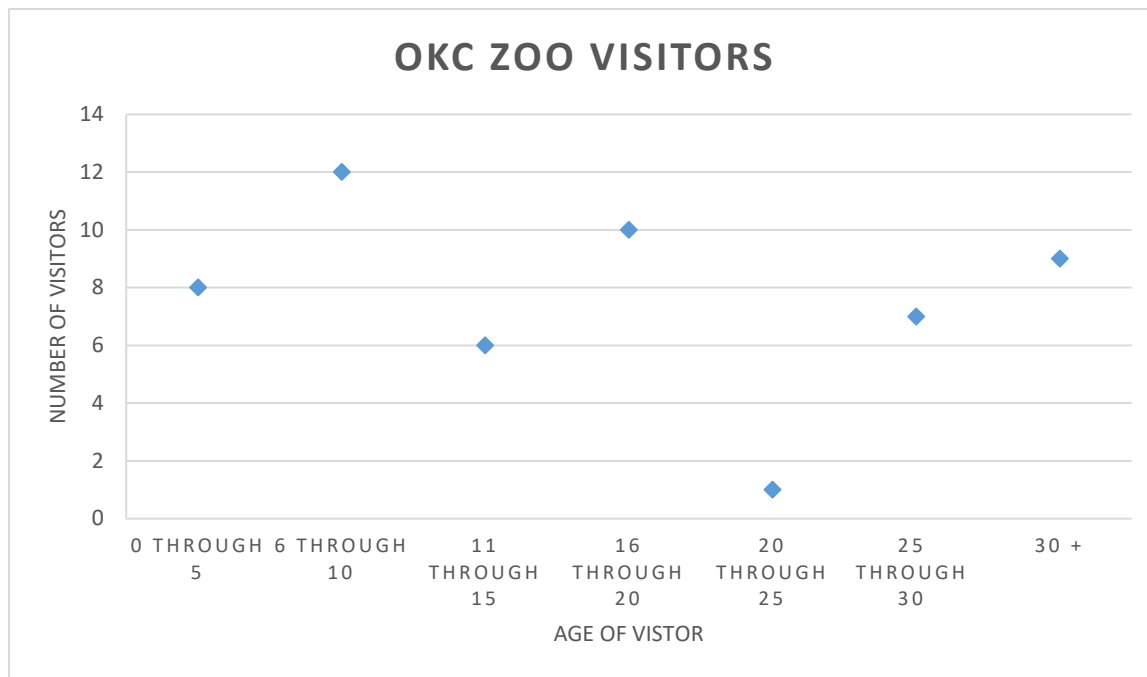
3. What would be the equation for the line of best fit?

4. What did the student who practiced 90 minutes per night score?

5. What is the type of relationship represented by this scatterplot?

6. Is it reasonable to assume that a student who practiced 140 minutes per night would score 600? Why or why not?

Use the scatterplot to answer questions 7-10.



7. What is the independent variable?

8. What is the dependent variable?

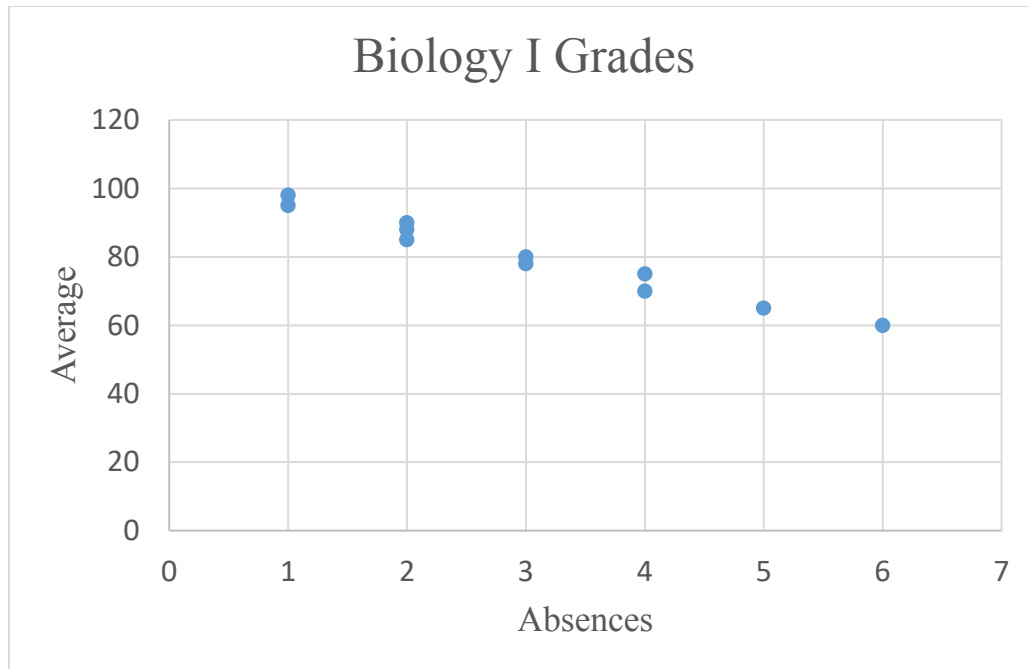
9. What is the line of best fit?

10. What is the type of relationship represented by this scatterplot?

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PA.D.1.3 Collect, display, and interpret data using scatter plots. Use the shape of the scatterplot to informally estimate a line of best fit, make statements about average rate of change, and make predictions about values not in the original data set. Use appropriate titles, labels, and units.

Use the scatterplot to answer questions 1-8.



1. What does the shape of the scatterplot tell you about the students in this Biology I class?

2. What is the independent variable?

3. What is the dependent variable?

Independent Practice (PA.D.1.3)

Name: _____

*Complete the following problems.**Use the scatterplot on the previous page to answer questions 4-8.*

4. What is the average rate of change?

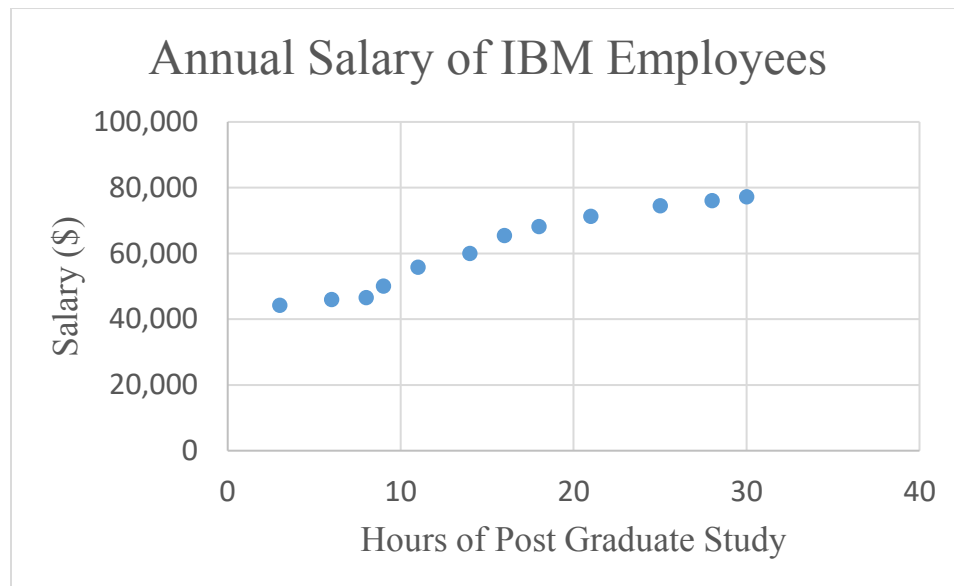
5. What would be the equation for the line of best fit?

6. What was the average of the student who was absent 5 times?

7. What is the relationship represented by the scatterplot?

8. Is it reasonable to assume that a student that was absent 7 times would have a B average? Why or why not?

Use the scatterplot to answer questions 9-16.



9. What does the shape of the scatterplot tell you about the annual salaries of the employees at IBM?

10. What is the independent variable?

11. What is the dependent variable?

12. What is the average rate of change?

Independent Practice (PA.D.1.3)

Name: _____

Use the scatterplot on the previous page to answer questions 13-16.

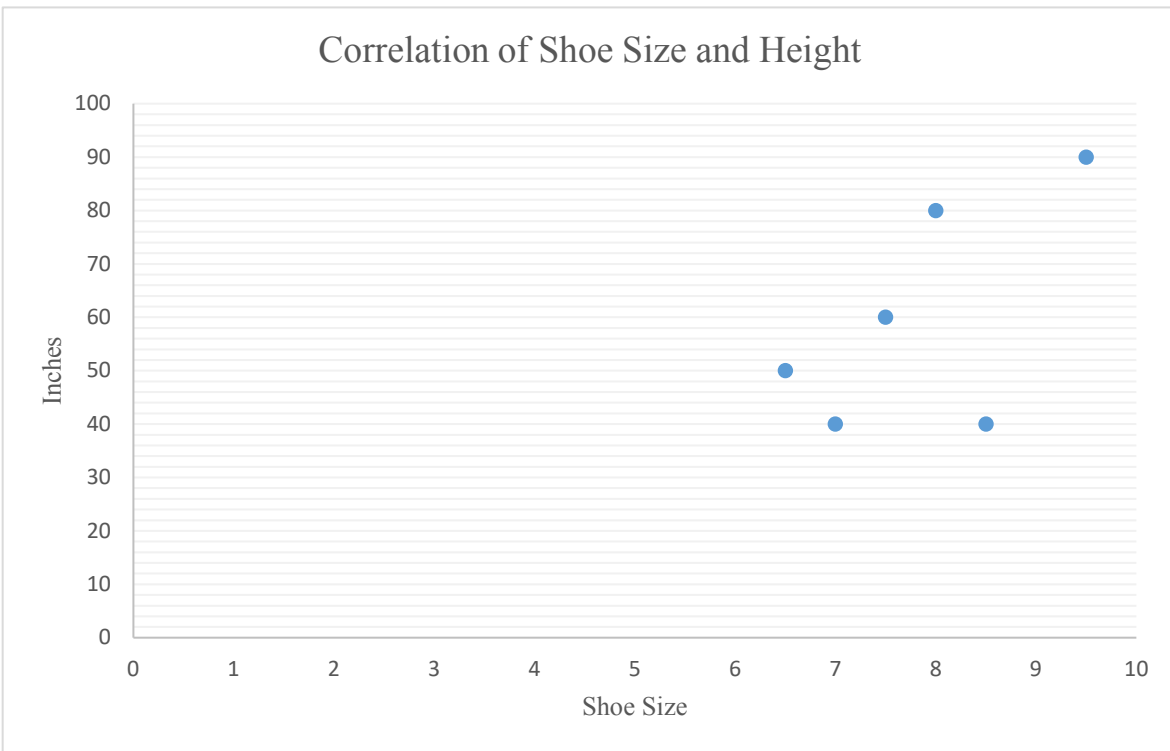
13. What would be the equation for the line of best fit?

14. What was the salary for the employee with 15 hours of post graduate study?

15. What type of relationship is represented by the scatterplot?

16. Is it reasonable to assume that an employee with 35 hours of post graduate study would earn \$84,000? Why or why not?

Use the scatterplot to answer questions 17-20.



17. What is the independent variable?

18. What is the dependent variable?

19. What is the line of best fit?

20. What is the type of relationship represented by this scatterplot?

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Complete the following problems:

1. Write 120,000,000,000 in scientific notation.

2. Janet works at We Are Cells. She earns \$650 per week plus 15% commission on all new cell phone contracts that she sells each week. Write a linear function that represents her weekly salary (s).

3. Evaluate $7b + a(6 - b)$ when $a = -3$ and $b = 4$.

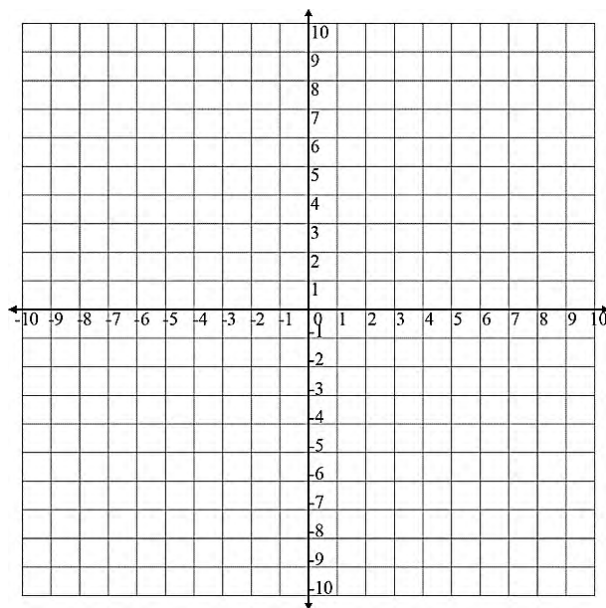
Translate the given linear function into the requested representation to answer questions 4-6.

$$y = -3x + 4$$

4. Make a table.

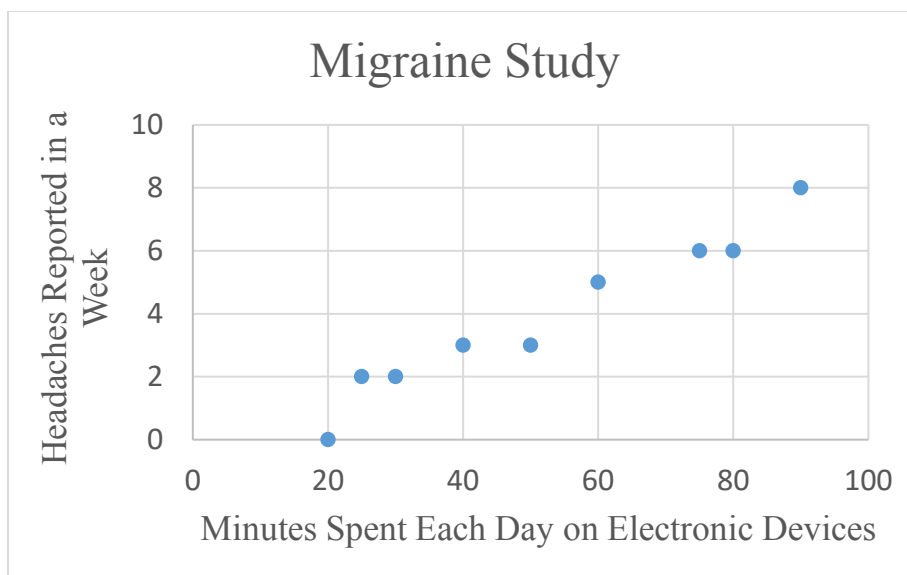
5. Describe in words.

6. Make a graph.



7. If the mean of a data set is 18 and you add 11, what will happen to the mean?

Use the scatterplot to answer questions 8-10.



8. What does the shape of the scatterplot tell you about the relationship between the amount of time spent each day on electronic devices and the number of headaches reported per week?

9. What is the equation for the line of best fit?

10. Is it reasonable to assume that a person who spends over 100 minutes per day on electronic devices would experience less than 5 headaches per week? Why or why not?

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PA.D.2.1 Calculate experimental probabilities and represent them as a percent, fractions, and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.

Real-World Connections

Have you played bingo and wondered why some people won multiple times and others never won? This is related to probability. The experimental probability is the number of times an outcome happened divided by the number of times the event was carried out. Therefore, if you played ten rounds of bingo and won three, the experimental probability would be 3 out of 10 or 30%.

Vocabulary

experimental probability	ratio of the number of times an event occurs to the total number of trials
---------------------------------	--

Complete the following problems.

Use the following scenario to answer questions 1- 5.

Jill flips a coin 25 times and it lands on heads 10 times.

1. Express Jill's experimental probability of flipping a coin, and it results in landing on heads as ratio.

2. What is Jill's experimental probability of flipping a coin and the results in landing on heads as a percent?

3. What is Jill's experimental probability of flipping a coin and it landing on heads as a decimal?

Guided Practice (PA.D.2.1)

Name: _____

Complete the following problems.

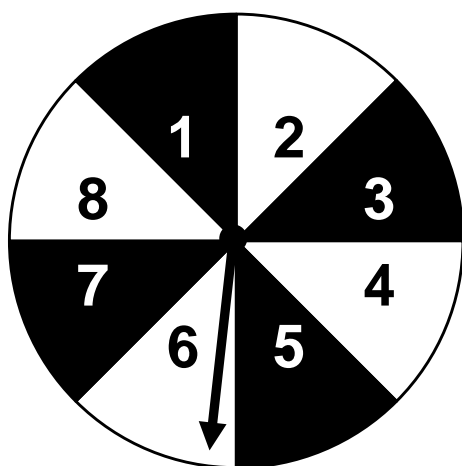
Use the following scenario to answer questions 4 - 5.

Jill flips a coin 25 times and it lands on heads 10 times.
--

4. What is Jill's experimental probability of flipping a coin and it landing on tails as a percent?

5. Is it reasonable to assume that if she flipped it another 10 times that it would land on heads at least twice? Why or why not?

Use the spinner to answer questions 6 - 10.



6. How likely is it to spin an even number?

7. How likely is it to spin a 3?

8. How likely is it to spin an odd number that is on a black section?

9. How likely is it to spin a black or white section?

10. How likely is it to spin a 1- 5?

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PA.D.2.1 Calculate experimental probabilities and represent them as a percent, fractions, and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.

Complete the following problems.

Use the data table to answer questions 1-5. Express as a fraction, decimal, and percent.

Number Rolled	Number of Times Number Rolled
1	8
2	10
3	3
4	4
5	13
6	12

1. Calculate the experimental probability of rolling a 2.

2. Calculate the experimental probability of rolling a 5.

3. Calculate the experimental probability of rolling an even number.

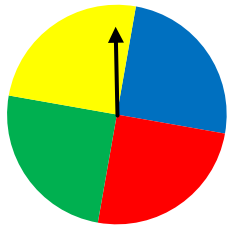
4. Calculate the experimental probability of rolling an odd number.

Independent Practice (PA.D.2.1)

Name: _____

*Complete the following problems.**Use the data table from the previous page to answer questions 1-5.*

5. Is it reasonable to predict that if rolled 20 more times at least 4 would be a 6? Why or why not?
- _____

Use the data table to answer questions 6-10.

Color on the Spinner	Number of Times Landed
Red	3
Blue	2
Green	1
Yellow	4

6. Calculate the experimental probability of landing on red.
- _____

7. Calculate the experimental probability of landing on green.
- _____

8. Calculate the experimental probability of landing on either green or red.
- _____

9. Calculate the experimental probability of not landing on yellow.
- _____

Independent Practice (PA.D.2.1)

Name: _____

Complete the following problems.

Use the data table from the previous page to answer questions 6-10.

10. Is it reasonable to predict that if spun 20 more times at least 6 would land on blue? Why or why not?

Use a standard random number generator (such as a dice) to answer questions 11-15.



11. How likely is it to roll a 9?

12. How likely is it to roll a 3 - 6?

13. How likely is it to roll a 2?

14. How likely is it to roll an even or an odd number?

15. How likely is it to roll a 1- 3?

Independent Practice (PA.D.2.1)

Name: _____

Complete the following problems.

Use two standard coins to answer questions 16-20.



16. How likely is it to flip both heads?

17. How likely is it that the first coin flipped would be tails?

18. How likely is to flip neither heads nor tails?

19. How likely is it that one of the two coins flipped would be tails?

20. How likely is it that the second coin flipped is either head or tails?

Complete the following problems.

1. Write 3.4×10^{-5} in standard notation.

2. Before his dive, Jim stood on a cliff 26 feet above Lake Texoma; at the end of his dive he was 18 feet below the surface. What was the total distance from the cliff to the deepest point of his dive? Is that a rational or irrational number?

Use the following scenario to answer questions 3-6.

Donna is handing out candy to children who visit her booth at the Fall Carnival. She gives each child 6 pieces of candy.

3. Identify the independent and dependent variables.

4. Describe in words the linear relationship of the scenario above.

5. Write the linear function and identify as proportional or not proportional.

6. Donna buys candy in 70-piece bags for \$10.95 and does not have to pay tax. She anticipates serving about 250 children. How much does she spend on candy?

Identify the data in the table as linear or nonlinear.

7.

x	7	6	3	-2
y	-2	0	2	4

Use the data table to answer questions 8-10.

Number on the Spinner	Number of Times Landed
1	6
2	3
3	1

8. Calculate the experimental probability of landing on 2. Express as a fraction, decimal and percent.

9. Calculate the experimental probability of landing on an odd number. Express as a fraction, decimal and percent.

10. Is it reasonable to assume that out of 100 spins, at least 45 would land on 2? Why or why not?

PA.D.2.2 Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population.

Real-World Connections

Have you ever seen poll results for elections on television? These are surveys used to predict the winner of an upcoming election or show where a particular candidate stands at that time. Although it would be great to survey every registered voter, that would be very difficult. Therefore, a sample of the population is surveyed. The way this sample is chosen can effect both the results and the validity of the survey. For example, if you only surveyed people as they walked out of the local Republican or Democratic office, the data would be heavily biased to one party.

Vocabulary

biased	sample in which individuals, items, or data were not equally likely to have been chosen
limited	a set number
population	whole set of individuals, items, or data from which a statistical sample is drawn
random	without any particular order or pattern
samples	subset of individuals, items, or data drawn from a population in order to make statistical conclusions of the population

Complete the following problems.

1. Would the sample of women in 50 major U.S. cities be a representation that could be generalized to the population of America? Why or why not?

Complete the following problems.

2. If in attempting to determine the average shoe size of adult males, you only used college basketball players, would this be a good sample? Why or why not?

3. What is the crucial factor for a sample selection to be random?

4. Malik surveys the students in his class to see what type of vending machine items should be sold. Could this survey be generalized for the entire school? Why or why not?

5. Denise completes a survey to determine if the people in her community would be interested in a new community park. She mails surveys with stamped return envelopes, makes phone calls, emails a poll, and asks people she sees on the street. Does her survey meet the requirements of being a random survey? Why or why not?

Use the following scenario to answer questions 6-10.

Nicki wanted to determine who was the all-time favorite OKC Thunder player of the students in her school from 3rd to 6th grade. There were 225 students. She stood at the end of the hallway and asked every student from 3rd to 6th grade who walked by. She polled 35 students and put the results in the following chart.

Player	Westbrook	Adams	Oladipo	Roberson	Patterson
# of votes by students	18	8	6	2	1

6. What type of sample is this?

7. Can she use this sample to predict what the entire population would choose?

8. How many students of the entire 3rd thru 6th grade should she expect to choose Westbrook? Since you cannot have part of a person, drop the decimal.

9. How many students of the entire 3rd thru 6th grade should she expect to choose Adams? Since you cannot have part of a person, drop the decimal.

10. How many students of the entire 3rd thru 6th grade should she expect to choose Oladipo, Roberson, and Patterson combined? Since you cannot have part of a person, drop the decimal.

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PA.D.2.2 Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population.

Complete the following problems.

1. A school district wants to determine which dental plan its employees would prefer. Which procedure would be most likely to obtain a statistically unbiased sample?
 - A Survey a random sample of employees from a list of all employees
 - B Invite all employees to indicate their choices by e-mail
 - C Place suggestion boxes at random locations in the company's plant and offices
 - D Assemble a group with one member from each department and record the preferences of these employees

2. Which question is biased?
 - A Do you prefer daytime or evening television programming?
 - B Should there be a school dress code?
 - C Do you prefer news or mindless sitcoms?
 - D Do you think a new highway should be built?

3. Juan asked 10 of his friends what they thought about a new video game. Is this sample of the students in the school biased? Why or why not?

4. At school, Brittany polled the first 47 bus riders at school for spirit week ideas. Is this sample of the student population biased? Why or why not?

Complete the following problems.

5. Jake surveyed the 7 fastest runners in P.E. class about their favorite class. Is this a random sample of the students in the school? Why or why not?

6. Mrs. Jensen assigned 3 different problems from each test given last year for a pretest this year. Each test had the same number of problems. Is this sample of the test random? Why or why not?

7. At the mall, a survey was conducted of 11 shoppers who spent the most money on Amazon.com® last month. Is this sample of the shoppers at the mall likely to be biased? Why or why not?

8. The seventh-grade math class wants to conduct a survey to determine the favorite shoe brand. Which sampling of students would be representative of the population? Circle the correct response.
- A Ask the first five students that enter Math class.
 - B Ask students' family members.
 - C Ask students with blue eyes.
 - D Ask all students in the 7th grade math class to put names on separate cards and draw 10 names.
9. Which of the following is an example of a random sample?
- A Pick five cards from a deck of cards.
 - B Ask students how much money basketball players make.
 - C Ask people at a baseball game what their favorite team is.
 - D Make a list of names and ask people what their favorite name is.

Complete the following problems.

10. Shelley wants to determine students' favorite soda. Explain how she could conduct a limited sample survey in one class to make a generalization of the entire population.

Use the following scenario to answer questions 11 and 12.

The Oklahoma State Department of Education is having a state conference for all teachers in Oklahoma. They want to have boxed lunches with submarine sandwiches. They will have 5,000 boxed lunches available, but do not know how many of each kind of sandwich to get. Levi suggests that he put a survey on his math webpage. Josh said he can send a poll to all English teachers. Sara suggested sending a survey to the first 100 teachers registered for the conference.

11. What type of sample did Levi suggest?

12. Who would receive the most accurate prediction based on their sample? Defend your answer.

Independent Practice (PA.D.2.2)

Name: _____

Use the following charts to answer questions 13-20.

100 registered participants were polled at random to predict which sandwiches and drinks should be available for the 5,000 attending.

Sandwich	Turkey	Ham	Roast Beef	Veggie
# chosen	42	28	11	19

Drink	Tea	Lemonade	Lemon Lime Soda	Water
# chosen	22	24	16	38

13. How many turkey sandwiches should they order?

14. How many ham sandwiches should they order?

15. How many roast beef sandwiches should they order?

16. How many veggie sandwiches should they order?

17. How many teas should they order?

18. How many lemonades should they order?

19. How many Lemon Lime Sodas should they order?

20. How many waters should they order?

Complete the following problems.

1. $3.4 \times 10^3 \cdot 2.1 \times 10^{-5}$

2. Between which two whole numbers on a number line would you find $\sqrt{115}$?

3. Sandra grooms dogs for \$14 per dog. She grooms twice as many on Saturday as on Sunday. How many dogs does she groom on Saturday if she earns \$252 for the weekend?

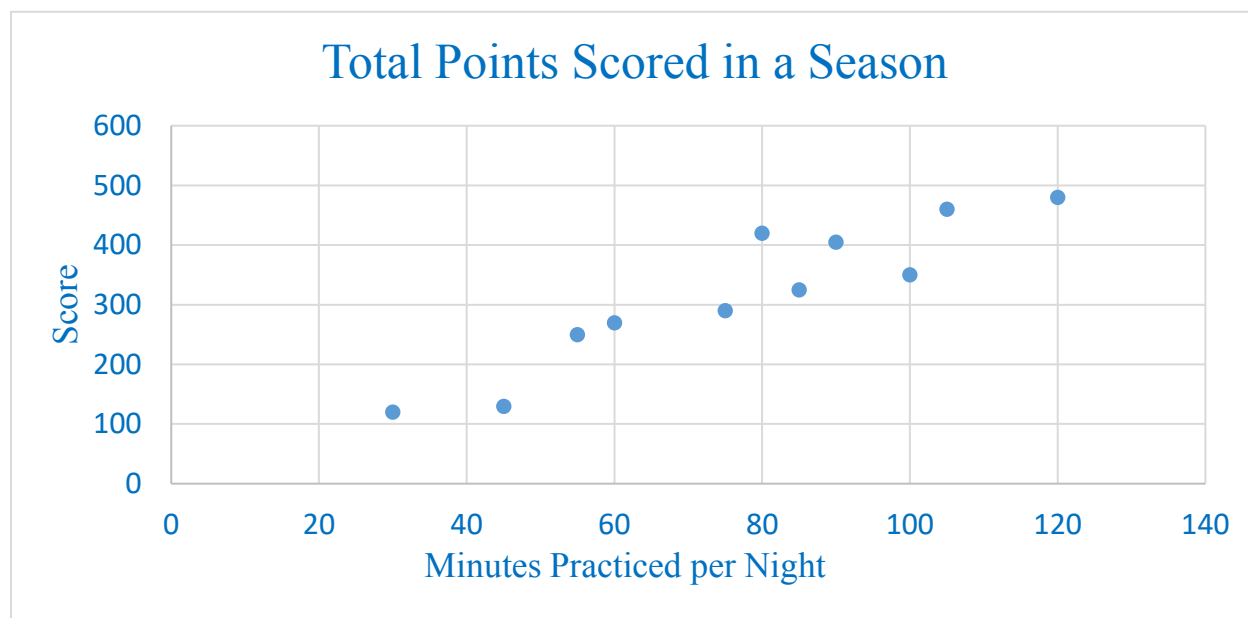
4. Write the equation for a linear function that represents a constant of 6 and a rate of change of 3.

5. If a boy's shoe size increases as his height increases, what is the dependent and independent variable?

6. Identify the outlier for the following data set.
12, 25, 26, 28, 31

Complete the following problems.

7. Describe the relationship in the following scatterplot.



8. Mr. Perkins surveyed one of his seventh-grade art classes and found students' favorite type of pet to be a cat. What inference from this sample data can he apply to all his classes? Circle the correct response.
- A Mr. Perkins can say students' favorite pet is a cat.
 - B Mr. Perkins can say that Juan's (one of his students) favorite pet is a cat.
 - C Mr. Perkins can say most of his students from one of his 7th grade classes prefer a cat as a pet.
 - D Mr. Perkins can say the least favorite pet is a cat.
9. Which of the following could be considered a random sampling?
- A rolling a die
 - B surveying your best friends
 - C pulling numbers from a hat
 - D surveying your neighbors

Complete the following problem.

10. Nick wants to determine students' favorite sandwich. Explain how he could conduct a random sample survey in one class to make a generalization for the entire population.

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PA.D.2.3 Compare and contrast dependent and independent events.**Real-World Connections**

Have you ever watched a football game? Some plays are independent of all others, while some are dependent on other plays happening first. An example of a dependent event is an extra point. You must first make a touchdown before you can attempt an extra point.

In a basketball game, the number of three point and two-point shots are both independent of one another. A player who was fouled attempting a shot can go to the free throw line and get two shots. The second free throw is independent of the first. However if the foul occurred on the floor with no shot attempt, the player gets to shoot a one and one. The first free throw is independent of the second, but the second depends on making the first.

Vocabulary

compare	show how two or more items are alike
contrast	show how two or more items are different
dependent events	events that can only occur if something else occurs first
independent events	events that can occur separately no matter what else occurs

Complete the following problems.

1. When rolling two number cubes, the outcomes of each are independent of one another. Explain why this is true?

2. When drawing three cards from a set of ten cards, the outcomes could be dependent or independent of one another. Explain how each are true.

Complete the following problems.

3. You have 10 marbles in a bag, 3 red, 4 blue, 2 green, and 1 orange. You have a 30% chance of grabbing a red marble from the bag. If the first marble you grab is green, and you do not return it, what is the probability that the second marble is red?

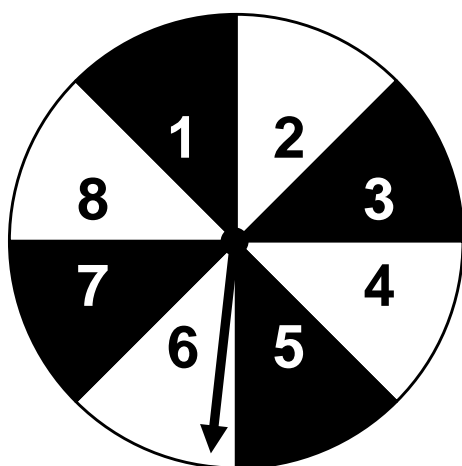
4. Was the second draw a dependent or independent event?

5. Nicki has a dozen cookies; half are chocolate chip, and the other half are peanut butter. She eats a chocolate chip cookie then chooses another cookie without looking. Is this a dependent or independent event?

6. Students can choose any career to research for career day. Is this a dependent or independent event?

Complete the following problems.

Use the spinner to answer questions 7-10.



7. You spin twice trying to get a sum of 10. The first spin is 3; what is the combined probability of reaching that sum?

8. You spin twice trying to get a product of 6 or greater. The first spin is 2; what is the combined probability of reaching that product?

9. You spin twice trying to get a difference of 1. The first spin is 6; what is the combined probability of reaching that difference?

10. You spin twice trying to get a quotient of 4. The first spin is 8; what is the combined probability of reaching that quotient?

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PA.D.2.3 Compare and contrast dependent and independent events.

Complete the following problems.

Identify each as a dependent or independent event and explain why.

1. Kensie draws 10 cards from a deck one at a time. She writes down what the card is and returns it before drawing the next card.

2. J.T. scored 15 points from free throws in the championship game.

3. During gym class the coach chooses two captains for a dodgeball game.

4. The captains take turns choosing players for their teams until all students have been chosen.

5. Shakya rolls two number cubes and writes down their products.

6. Carolyn flips a coin 20 times and writes down the results of each flip.

7. The Math League plays a game with random number cubes. If you roll a six, your partner must roll a six before you can roll again.

Independent Practice (PA.D.2.3)

Name: _____

Complete the following problems. Identify each as a dependent or independent event and explain why.

8. For prizes, Janet draws names from a hat. Each person can win multiple prizes because the names are returned after each draw.

9. In gym the girls play freeze tag. Once you are tagged, you are frozen until a team mate crawls through your hula hoop.

10. Jackson and Theo are playing chess.

Use the information in the box to answer questions 11-13.

A jar contains 5 red marbles, 6 green marbles, and 7 blue marbles.

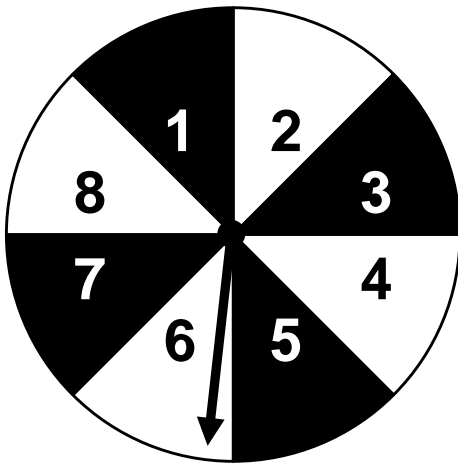
11. If you draw a green marble the first time and put it back in the jar, what is the probability the second marble you choose will also be green? Answer with a fraction, decimal, and percent.

12. If you draw a red marble and put it back then draw a blue marble and put it back, what is the probability that the next time you will draw a red marble and a blue marble if you replaced the marble after each drawing? Answer with a fraction, decimal, and percent.

Use the scenario on the previous page to answer question 13.

13. If you draw a blue marble the first time and put it back in the jar, what is the probability the second marble you choose will also be blue? Answer with a fraction, decimal, and percent.

Use the spinner to answer questions 14 and 15.



14. You spin trying to get an even number. The first spin is 3. What is the combined probability of reaching an even number? Answer with a fraction, decimal, and percent.

15. You spin trying to get an odd number. The first spin is 5. What is the combined probability of reaching an odd number? Answer with a fraction, decimal, and percent.

Independent Practice (PA.D.2.3)

Name: _____

Draw a spinner numbered 1-7. Use it to answer questions 16 and 17.

16. Spin the dial once and toss a coin once. What is the probability of getting an even number on the spinner and a head on the coin?

17. Spin the dial once and toss a coin once. What is the probability of getting an odd number on the spinner and a tail on coin?

Use the scenario to answer questions 18-20. Express your answers as a fraction.

You draw four cards from a standard deck of 52 playing cards. If each card is returned after being drawn,

18. What is the probability of choosing 4 hearts?

19. What is the probability of choosing 3 aces?

20. What is the probability of choosing four red cards?

Complete the following problems:

1. Find the value of y for the function $y = \frac{1}{4}x + 2$, given that $x = 48$. Are you finding the independent or dependent variable for the function?

2. Write the revised equation for $y = -5x + 2$ if the slope was changed to 5 and the y -intercept remained the same?

3. Solve and graph $x + 4 < 3$.

4. If the mean of a given data set is 18, predict how the mean would change if a 12 was added to the data set.

5. If a student's score on a math test decreases as the number of hours spent watching television increases, what type of relationship is this?

6. Nikita rolled a number cube 10 times. She rolled a 6 twice, a 3 five times, a 2 once, and a 1 twice. What was her experimental probability of rolling a 6? Express as a fraction, decimal, and percent.

7. Daniel wanted to petition the school to add weight machines in the gym. He used data to prove that the school would make use of the weight machines. If he only surveyed the males on his football team, would his sample be biased? Why or why not?

8. The game has a spinner with colors and a fair, six-sided number cube. Each turn you spin the spinner and roll the cube to determine your move. So that if you spin green and roll a three, you move ahead 3 green spaces. Are these dependent or independent events?

Use the scenario to answer questions 9 and 10.

Mrs. Jackson will order pizza for the PTA meeting. She orders one pizza for every 4 in attendance.

9. Is the number of people in the meeting an independent or dependent event?

10. Is the number of pizzas ordered an independent or dependent event?

PA.GM.1.1 Informally justify the Pythagorean Theorem using measurements, diagrams, or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles.

Real-World Connections

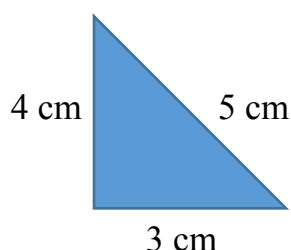
Although the Pythagorean Theorem can be used for many shapes, you will focus on its use with right triangles. When determining the dimensions of a television screen, you use the Pythagorean Theorem to find the diagonal length. Another helpful use is determining the amount of line needed to connect an antenna to the ground, make a zip line, or the length of a ladder needed to reach the roof of your house.

Vocabulary

Pythagorean Theorem	for any right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse
measurements	use of standard units to determine size or quantity in regard to length, breadth, height, area, mass or weight, volume, fluid volume, capacity, temperature, and time
diagrams	simplified drawing or sketch
dynamic software	software that can be used in the classroom for mathematics
two dimensions	having length and width or breadth
three dimensions	having length, width or breadth, and height
right triangles	three sided shape that has one right angle, 90°

Identify the legs and the hypotenuse of the given right triangle.

1.



Guided Practice (PA.GM.1.1)

Name _____

Simplify the radical.

2. $\sqrt{50} =$ _____

3. $\sqrt{432} =$ _____

Use Pythagorean Theorem to find the unknown length of the right triangle.

4. Leg Length A: 10 cm

Leg Length B: 24 cm

Hypotenuse: ?

5. Leg Length A: ?

Leg Length B: 120 mm

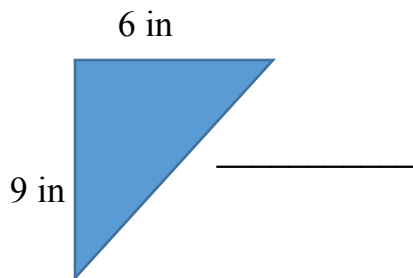
Hypotenuse: 123 mm

6. Leg Length A: 9 in

Leg Length B: ?

Hypotenuse: 15 in

7.

*Determine if the given lengths would create a right triangle.*

8. 12, 14, 18

Solve.

9. The slide at the playground has a height of 3 meters. The length across the ground from the base of the ladder to the end of the ladder is 6 meters. What is the length of the sliding board?

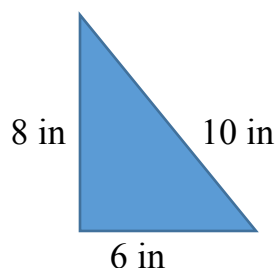
10. The bottom of a ladder must be placed 5 feet from a wall. The ladder is 13 feet long. How far above the ground does the ladder touch the wall?

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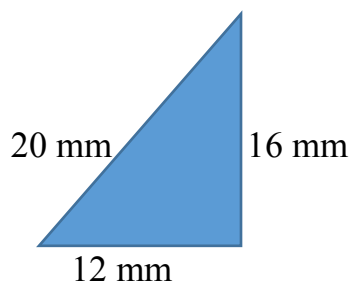
PA.GM.1.1 Informally justify the Pythagorean Theorem using measurements, diagrams, or dynamic software and use the Pythagorean Theorem to solve problems in two and three dimensions involving right triangles.

Identify the legs and the hypotenuse of the given right triangle.

1.



2.



Simplify the radical.

3. $\sqrt{200} =$ _____

4. $\sqrt{243} =$ _____

5. $\sqrt{12} =$ _____

6. $\sqrt{187} =$ _____

Independent Practice (PA.GM.1.1)

Name _____

Use Pythagorean Theorem to find the unknown length of the right triangle.

7. Leg Length A: 6 cm

Leg Length B: 8 cm

Hypotenuse: ?

8. Leg Length A: 18 mm

Leg Length B: 80 mm

Hypotenuse: ?

9. Leg Length A: ?

Leg Length B: 24 in

Hypotenuse: 25 in

10. Leg Length A: ?

Leg Length B: 60 cm

Hypotenuse: 61 cm

11. Leg Length A: 15 ft

Leg Length B: ?

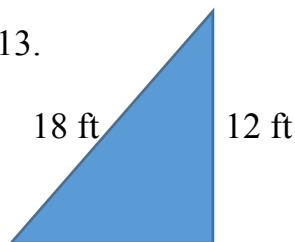
Hypotenuse: 39 ft

12. Leg Length A: 10 yd

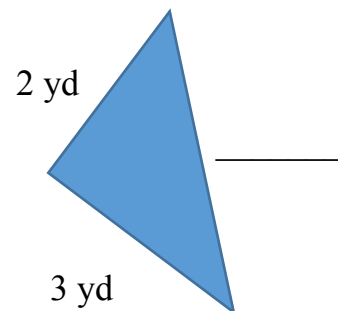
Leg Length B: ?

Hypotenuse: 17 yd

13.



14.



Independent Practice (PA.GM.1.1)

Name _____

Determine if the given lengths would create a right triangle.

15. 11, 15, 19

16. $2\sqrt{5}$, 4, 2

Solve.

17. John walks 2 miles east from his house on Gore Blvd. to get a drink at the convenience store then turns south on 52nd street for 4 miles to visit his friend Trisha. He is running late, so when he leaves, he walks by the train tracks that go diagonally from Trisha's house to his own. How far did he walk home?

18. In shop class, you make a table. The sides of the table measure 24" and 18". If the diagonal of the table measures 30", is the table "square"? (In construction, the term "square" means the table has *right angles* at the corners.) Defend your answer mathematically.

19. A rectangular picture frame has a diagonal length of 50 centimeters and a height of 14 centimeters. What is the area of the wall covered by the picture?

20. A baseball "diamond" is a square with sides of 90 feet. If a runner tries to steal second base, about how far must the catcher, at home plate, throw to get the runner "out"? Given this information, explain why runners more often try to steal second base than third.

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Simplify using properties and the order of operations.

1. $4 - 3 + [3 - 3(4 \div 12) + 5] - 3$

What value of x makes the equation true?

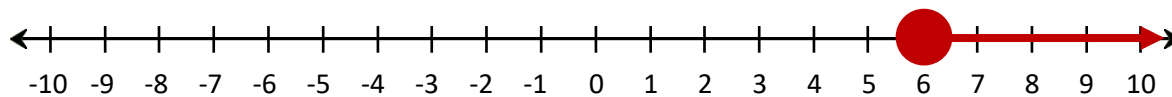
2. $4(-3x - 5) = 2(-6x + 8)$

3. $2(-4x - 8) = 6x + 12$

4. $2(9x - 6) = 6(3x - 2)$

Identify the equation illustrated by the graph.

5.



6. Denise and three of her friends, decided to divide the cost to get their teacher Mrs. Nelson a Christmas present. They split the cost evenly. If each person's part exceeded \$13.00, what was the total bill?

7. Max's employer has no more than \$18.00 to spend on tool belts for his crew. How many can he buy if each tool belt costs \$4.50?

8. A practice field used by the football team is a rectangle 90 meters wide and 120 meters long. The coach asks players to run from one corner to the corner diagonally across the field. How far do the players run?

9. Looking at the front of Nicki's doll house, the roof makes a right triangle. The height of the roof is 6 inches and the length across the bottom is 8 inches. Find the diagonal from the top to the opposite side. What is the perimeter of this triangle?

10. Jackie orders a large slice of cheesecake that measures 13 millimeters on the outer two edges and 10 millimeters across the bottom. She cuts it in half creating two smaller right triangle slices to share with her best friend Nancy. What area of Nancy's plate does her cheesecake cover?

PA.GM.1.2 Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane.

Real-World Connections

In a coordinate plane, it is easy to find the length of a line that is vertical or horizontal, by counting. However, finding the exact length of a diagonal line requires more effort. You do this by drawing in a vertical and horizontal line, creating a right triangle. You can use the Pythagorean Theorem to find the length of the diagonal line. This is often referred to as $v^2 + h^2 = d^2$. The v is the vertical length, h is the horizontal length; and d is the diagonal length. The vertical and horizontal lengths represent the legs of the right angle, and the diagonal length is the hypotenuse. This skill will be enhanced later in Geometry.

Vocabulary

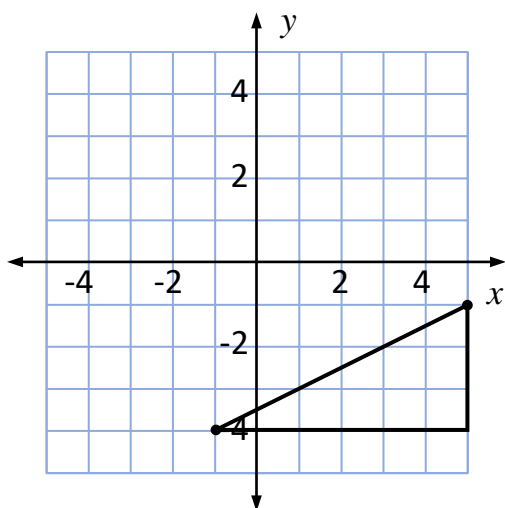
Pythagorean Theorem	for any right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse
points	defined position in space, represented by an ordered pair (x, y) in a coordinate plane
coordinate plane	plane in which a point is represented using two coordinates that determine the precise location of the point

Guided Practice (PA.GM.1.2)

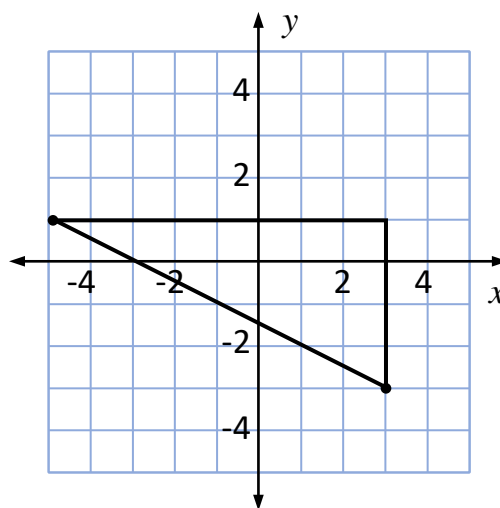
Name _____

Identify the parts of the Pythagorean Triangle.

1.

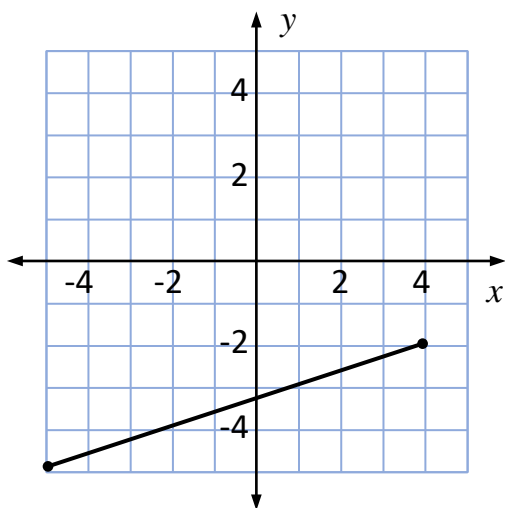


2.

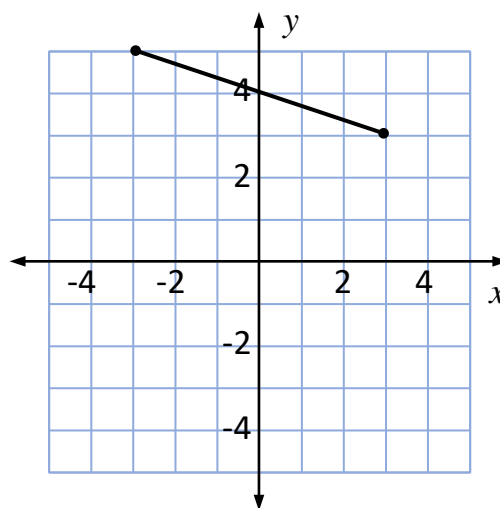


Use Pythagorean Theorem to find the distance between the points on the coordinate plane.

3.



4.

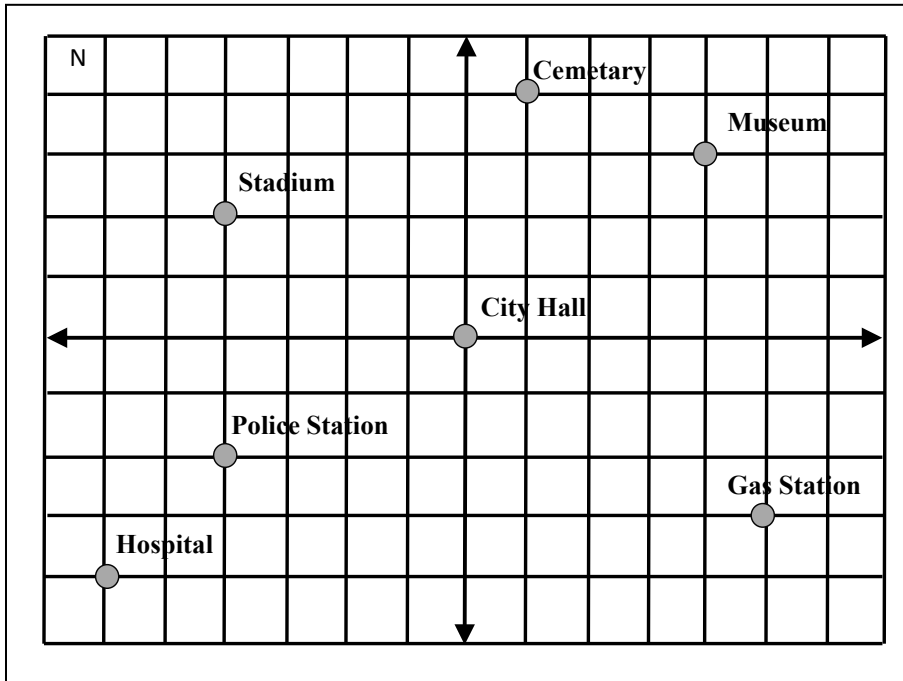


Use Pythagorean Theorem to find the distance between the two given points.

5. $(8, 7), (4, 5) =$ _____

6. $(-8, 3), (1, 0) =$ _____

Use the coordinate plane to answer questions 7-10, each unit is 1 mile.



7. What is the shortest distance from the gas station to City Hall?

8. What is the shortest distance from the police station to City Hall?

9. What is the shortest distance from the stadium to City Hall?

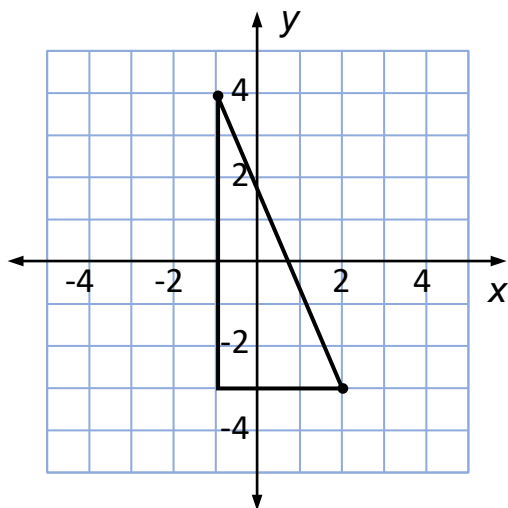
10. What is the shortest distance from the police station to the hospital?

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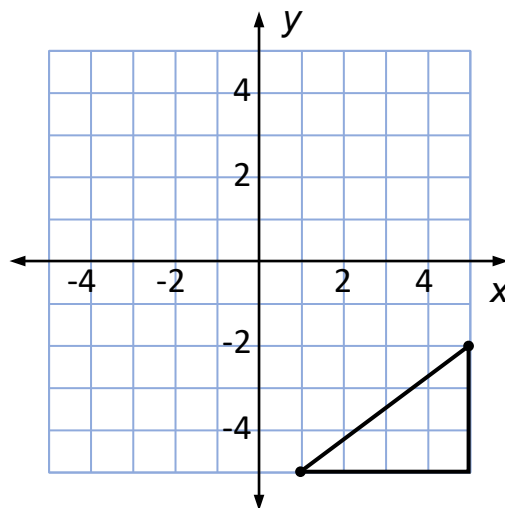
PA.GM.1.2 Use the Pythagorean Theorem to find the distance between any two points in a coordinate plane.

Identify the parts of the Pythagorean Triangle.

1.

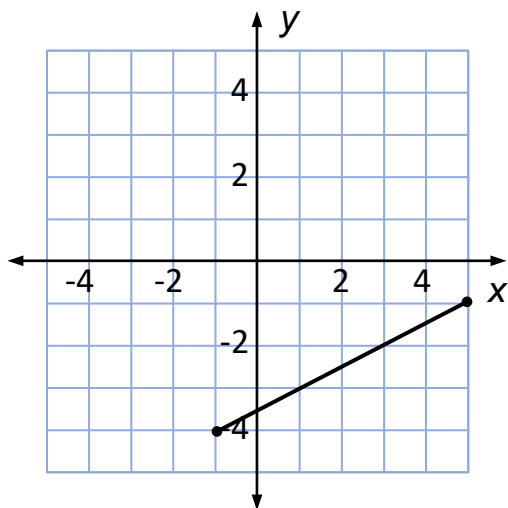


2.

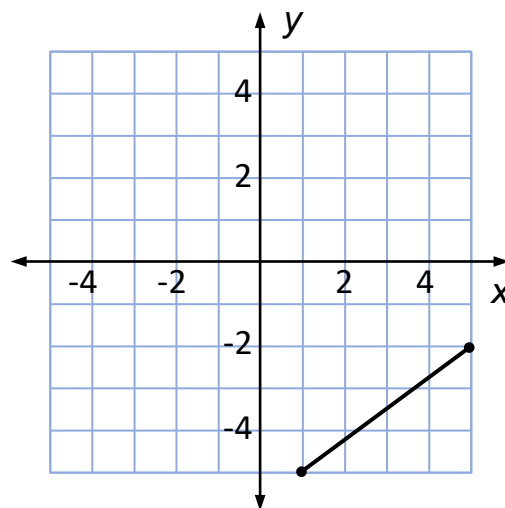


Use Pythagorean Theorem to find the distance between the points on the coordinate plane.

3.



4.

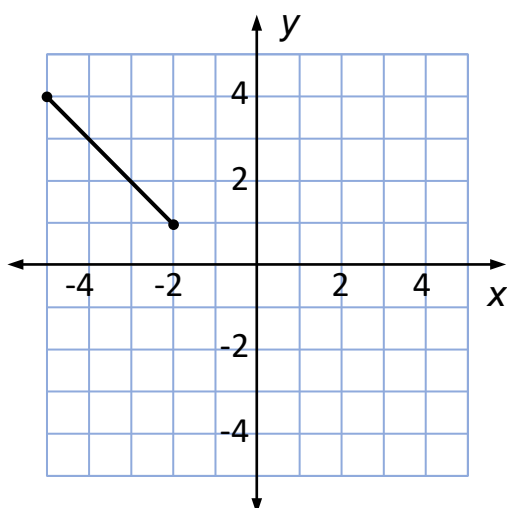


Independent Practice (PA.GM.1.2)

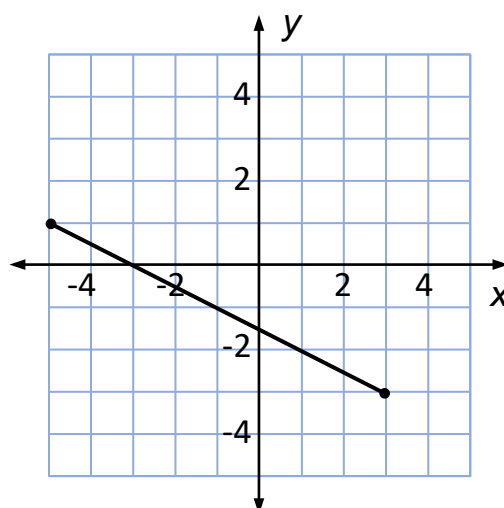
Name _____

Use *Pythagorean Theorem* to find the distance between the points on the coordinate plane.

5.



6.



Use *Pythagorean Theorem* to find the distance between the two given points.

7. $(-3, 7), (2, -5) =$ _____

8. $(0, 4), (3, 0) =$ _____

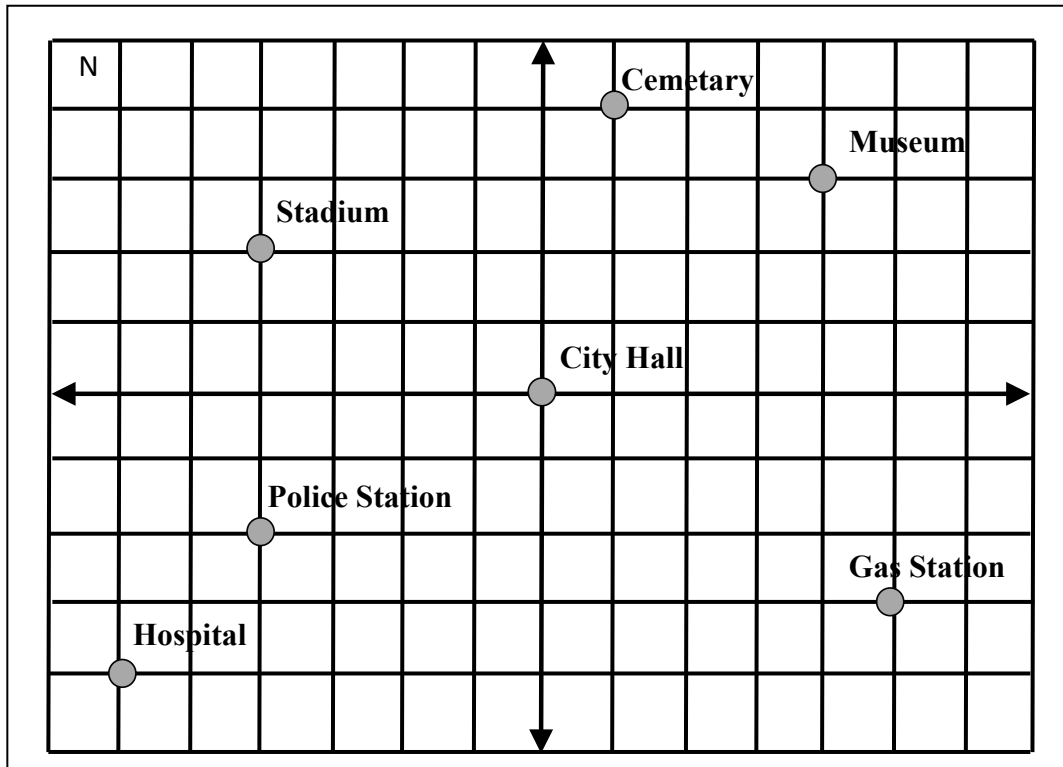
9. $(2, -6), (-7, 6) =$ _____

10. $(-2, 0), (4, 3) =$ _____

11. $(4, -2), (0, 3) =$ _____

12. $(8, 0), (-4, -6) =$ _____

Use the coordinate plane to answer questions 13-20. Each unit is 1 mile.



13. What is the shortest distance from the museum to City Hall?

14. What is the shortest distance from the stadium to cemetery?

15. What is the shortest distance from the museum to police station?

16. What is the shortest distance from the hospital to the gas station?

17. What is the shortest distance from the museum to the stadium?

Independent Practice (PA.GM.1.2)

Name _____

Use the coordinate plane on the previous page to answer questions 18-20. Each unit is 1 mile. Round to the nearest whole mile if it is an imperfect square.

18. What is the shortest distance from the police station to the gas station?

19. What is the shortest distance from the cemetery to police station?

20. What is the shortest distance from the gas station to cemetery?

Write in standard notation.

1. $1.302 \times 10^8 =$

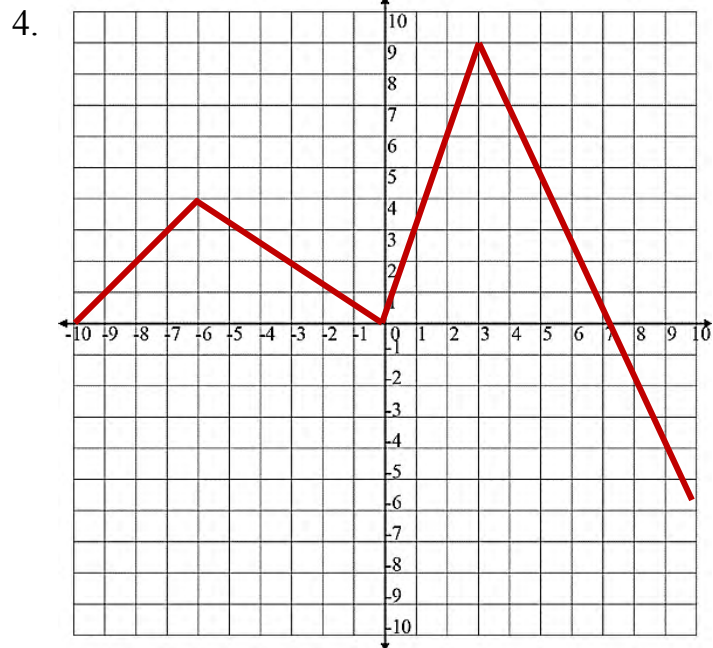
Identify factors as rational or irrational, simplify and identify as rational or irrational.

2. $\sqrt{25} \cdot \pi =$

Identify the independent and dependent variable.

3. Jon is paid \$7 per hour. Last week Jon made \$210.

Identify the function as linear or nonlinear.



Write the new equation.

5. A line at $y = 2x + 3$ slides down the y-axis 8 units and is perpendicular to the original line.

Use the Pythagorean Theorem to find the length of the missing side.

6. A triangle with legs that are 6 inches and 8 inches long.

7. A triangle with a leg that is 20 centimeters and a hypotenuse that is 52 centimeters long.

8. A triangle with legs that are 3 millimeters and 6 millimeters long.

9. What is the length of a line whose endpoints are (0, 3) and (9, -9)?

10. If a pavilion is 40 feet straight east from the edge of a pond and a flag pole is 9 feet north of the pavilion. What is the shortest distance from the flag pole straight the edge of the pond?

PA.GM.2.1 Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2 .

Real-World Connections

Have you ever helped wrap a present or paint a box? These are two examples of the real world application of surface area, covering of all sides. A rectangular prism is a three-dimensional shape having length, width, height, and made up of six rectangles. The surface area is the total area of all six sides; however, you only need to calculate three sides and double their sum because the top and bottom have the same area, as do the front and back and both sides.

Vocabulary

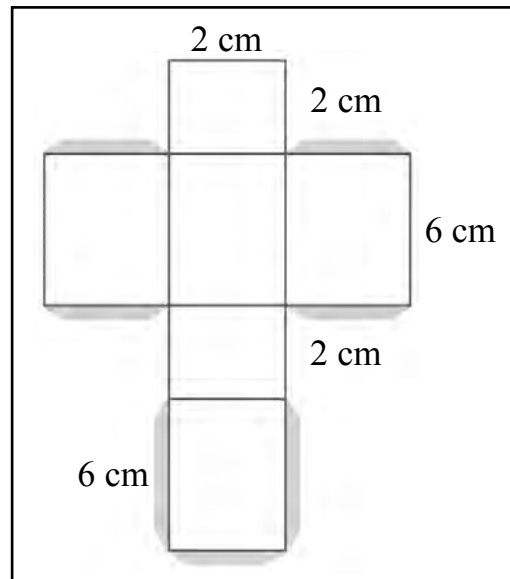
calculate	to work something out, a mathematical operation
cm^2	a cm raised to the second power which is indicated by a small 2 to its upper right
decomposition	breaking apart of a three-dimensional figure into its two dimensional sides
nets	a two-dimensional representation of a three-dimensional figure constructed of polygons, such that if a fold were made on certain edges of the net and appropriate sides were “glued” together, the resulting figure would be the original three-dimensional figure
rectangular prism	a three-dimensional object constructed from three pairs of parallel congruent rectangles (called faces) that share common edges so as to form an enclosed space
surface area	total measure of the area of the faces of a prism

Complete the following problems.

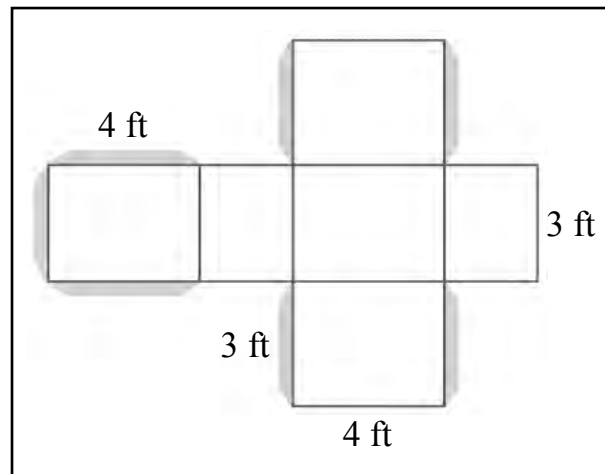
1. Which decomposition could represent a rectangular prism?

- A 2 triangles with an area of 10 feet² and 3 rectangles with an area of 6 feet²
- B 2 squares with an area of 9 feet² and 4 rectangles with an area of 15 feet²
- C 4 triangles with an area of 12 feet² and 1 square with an area of 18 feet²
- D 4 squares with an area of 16 feet² and 2 trapezoids with an area of 24 feet²

2. Calculate the surface area of the rectangular prism.



3. Calculate the surface area of the rectangular prism.



Complete the following problem.:

4. Calculate the surface area of the rectangular prism with a base of 4 centimeters by 3 centimeters, a back of 4 centimeters by 2 centimeters, and sides of 2 centimeters by 3 centimeters.

5. Calculate the surface area of the rectangular prism with a base of 6 inches by 8 inches, a back of 6 inches by 5 inches, and sides of 8 inches by 5 inches.

Calculate the surface area of each rectangular prism.

	BASE	BACK	SIDES	SURFACE AREA
6.	3 ft by 2 ft	4 ft by 3 ft	2 ft by 4 ft	
7.	6 in by 7 in	6 in by 3 in	7 in by 3 in	
8.	2 cm by 5 cm	2 cm by 10 cm	5 cm by 10 cm	
9.	6 ft by 2 ft	6 ft by 5 ft	2 ft by 5 ft	
10.	3 in by 9 in	3 in by 4 in	9 in by 4 in	

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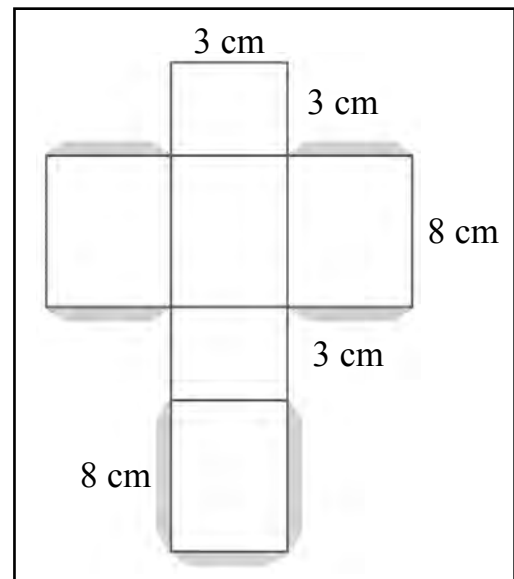
PA.GM.2.1 Calculate the surface area of a rectangular prism using decomposition or nets. Use appropriate measurements such as cm^2 .

Complete the following problems:

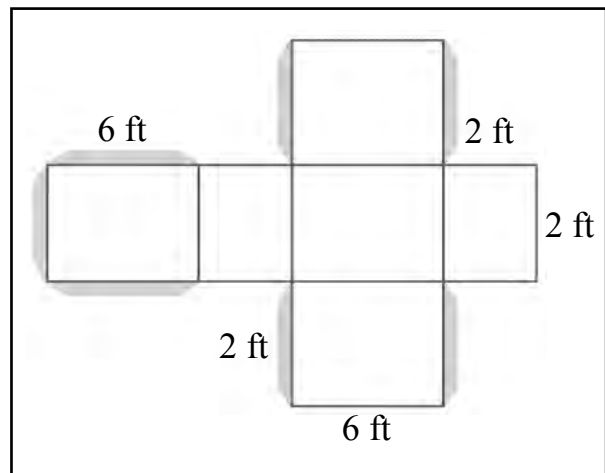
1. Which decomposition could represent a rectangular prism?

- A 4 squares with an area of 4 feet² and 2 trapezoids with an area of 14 feet²
- B 2 triangles with an area of 12 feet² and 3 rectangles with an area of 8 feet²
- C 2 squares with an area of 25 feet² and 4 rectangles with an area of 15 feet²
- D 4 triangles with an area of 18 feet² and 1 square with an area of 36 feet²

2. Calculate the surface area of the rectangular prism.



3. Calculate the surface area of the rectangular prism.



Solve.

4. Calculate the surface area of the rectangular prism with a base of 9 inches by 7 inches, a back of 9 inches by 3 inches, and sides of 7 inches by 3 inches.

5. Calculate the surface area of the rectangular prism with a base of 12 millimeters by 6 millimeters, a back of 12 millimeters by 9 millimeters, and sides of 9 millimeters by 6 millimeters.

6. Calculate the surface area of the rectangular prism with a base of 3 yards by 2 yards, a back of 3 yards by 1 yard, and sides of 2 yards by 1 yard.

7. J.T. put Sam's gift in a box, in another box, and then in another box. The last box was two feet deep, three feet long, and two feet tall. How many square inches of wrapping paper does J.T. need to wrap the last box?

8. Robert is building a birdhouse. He builds it 18 inches tall, 6 inches deep, and 4 inches across. If he makes an opening that is 3 square inches for the birds to come in and out, what is the surface area of the birdhouse?

Solve.

9. Dr. Polk is painting the walls of her office. Two of the walls are 3 yards tall and 5 yards long. The other two walls are 3 yards tall and 2 yards across. If she has windows that total 10 square yards and a door that is 3.75 square yards, how many square yards will she need to paint?

10. Jeff is lining the inside of a box with felt. The box is 9 inches long, 5 inches deep, and 3 inches tall. If he does not line the lid, how much felt does he need?

11. Hank is wrapping his mother's birthday present. The box has a base of 8 centimeters by 4 centimeters, a back of 8 centimeters by 3 centimeters, and sides of 4 centimeters by 3 centimeters. How much wrapping paper does he need?

12. Abbie is painting her bedroom. Two walls are 8 feet tall and 10 feet long. The other walls are 8 feet tall and 12 feet long. If she has a window with a total of 12 feet² and doors that are a total of 42 feet², how many square feet will she need to paint?

13. How many gallons of paint will Abbie need to purchase if each gallon will cover 75 feet²?

Solve.

14. The paint store is selling paint for \$12.59 per gallon. Use the calculations in question 13 to calculate how much will the paint cost to paint Abbie's room.

15. Samuel is lining the bed of his truck. The base is 6 feet by 4 feet, the sides are 6 feet by 3 feet, and 4 feet by 3 feet. How much lining does he need?

16. Evelyn is wrapping her aunt's wedding gift. The box is 9 inches by 7 inches, 9 inches by 5 inches, and 5 inches by 7 inches. How much paper does she need?

17. What is the surface area of a number cube that is 2 centimeters by 2 centimeters?

Calculate the surface area for each rectangular prism.

	BASE	BACK	SIDES	SURFACE AREA
18.	7 in by 3 in	5 in by 3 in	5 in by 7 in	
19.	2 ft by 3 ft	2 ft by 4 ft	3 ft by 4 ft	
20.	1 in by 5 in	5 in by 3 in	1 in by 3 in	

Complete the following problems.

1. $4^3 =$ _____

2. Express 21,400,000 in scientific notation.

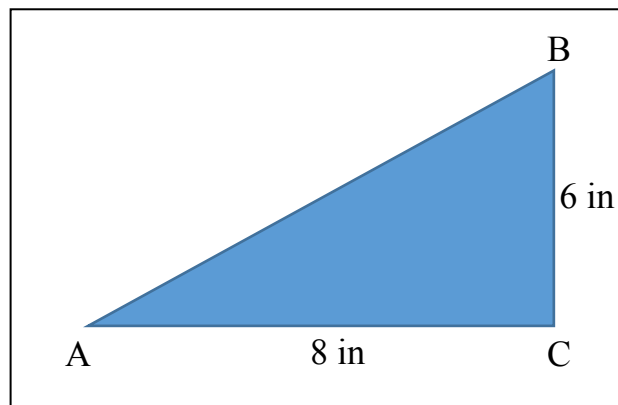
3. Place these numbers in order **greatest to least**.

$3.6, 2^2, \sqrt{6}$

4. How would the line $2x - 7$ change if the y-intercept was changed to -2?

5. Evaluate $2x + 7$ if $x = -3$.

6. What is the length of side AB?



Complete the following problems.

7. If rectangle ABCD has vertices at $(-2, 3)$, $(4, 3)$, $(4, 0)$ and $(-2, 0)$, what is the length of the diagonal BD?

8. Carolyn is painting a dog house. The dog house is 3 feet tall, 4 feet wide, and 4 feet across. She is not painting the bottom, and she cut out an opening that is 2 feet². How many square feet is she painting?

9. If 1 gallon of paint covers 35 feet², how many gallons of paint would Carolyn need to paint the dog house in question 8?

10. The hardware store has paint on sale, buy one gallon and get the second half off. She finds a color that she likes for \$14.95. What was her subtotal before taxes?

PA.GM.2.3 Develop and use the formula $V=lwh$ and $V=Bh$ to determine the volume of rectangular prisms. Justify why the base area (B) and height (h) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3 .

Real-World Connections

Have you ever wondered why a cereal box is a certain size? Companies must maximize how much a container will hold, volume, while using the least amount of material (surface area of the container). This will keep cost down and allow for larger profits. Since a rectangular prism has a length, width, and height, you can use the product of these three measurements to determine its volume. Another way to find the volume would be to use the area of the base and multiply by the height of the prism. This would be like stacking the base over and over until it was the height of the prism. Mathematicians use the symbol B to represent area of the base.

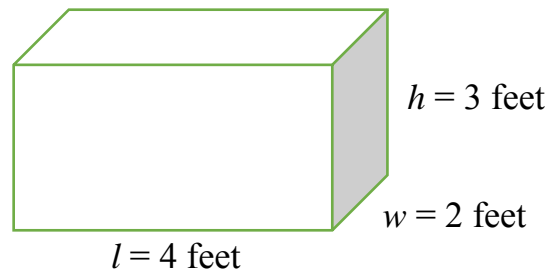
Vocabulary

base area	the area of the base
cm^3	a cm raised to the third power which is indicated by a small 3 to its upper-right
formulas	a group of mathematical symbols that express a relationship or that is used to solve a problem
height	measurement from top to bottom
rectangular prism	a three-dimensional object constructed from three pairs of parallel congruent rectangles (called faces) that share common edges so as to form an enclosed space
volume	measurement of the amount of space within a closed three-dimensional shape

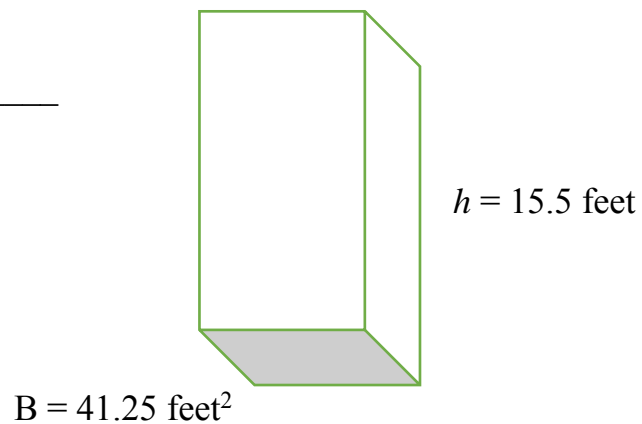
Solve.

1. Explain why both length times width times height (lwh) and the area of the base times height (Bh) can be used to find the volume of a rectangular prism?
- _____

2. Calculate the volume of the rectangular prism.
- _____



3. Calculate the volume of the rectangular prism to the nearest hundredth of a foot.
- _____

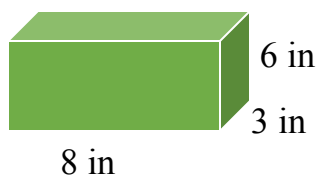


Guided Practice (PA.GM.2.3)

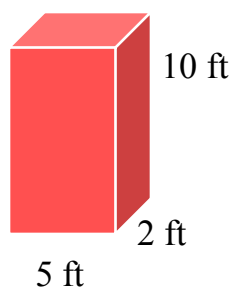
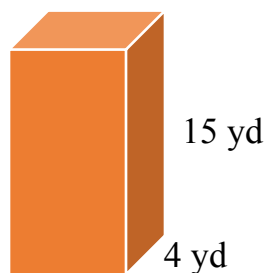
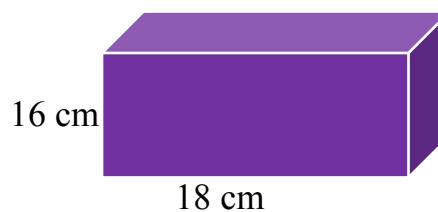
Name: _____

Calculate the volume of the given rectangular prism. Round to the nearest hundredth.

4.



5.

*Find the missing length. Round to the nearest hundredth.*6. Volume = 420 yd^3 7. Volume = $1,728 \text{ cm}^3$ 

Solve.

8. Calculate the volume of a rectangular prism with a base of 81.25 centimeters² and a height of 8.5 centimeters.

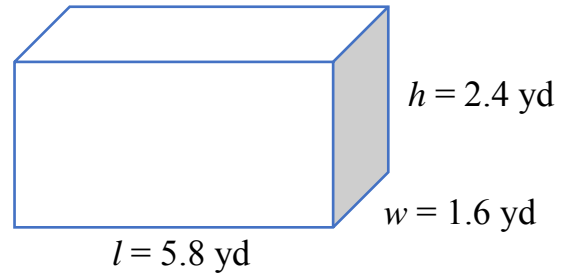
9. Calculate the volume of a rectangular prism with a length of 6 inches, a width of 4 inches, and a height of 7 inches.

10. The City of Chickasha built a new rectangular pool. It is 12 feet long, 8 feet wide, and 4 feet deep. What is the capacity of the pool?

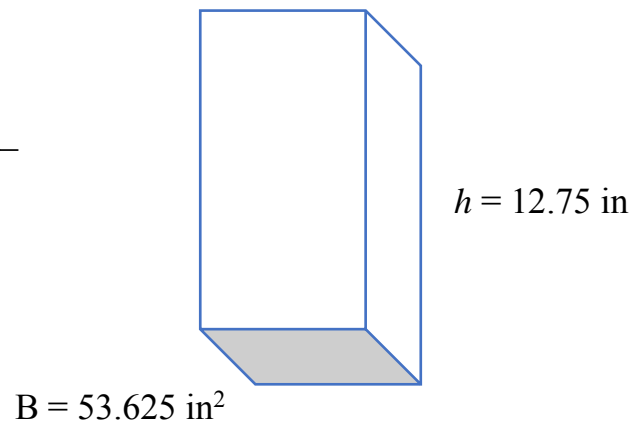
PA.GM.2.3 Develop and use the formula $V=lwh$ and $V=Bh$ to determine the volume of rectangular prisms. Justify why the base area (B) and height(h) are multiplied to find the volume of a rectangular prism. Use appropriate measurements such as cm^3 .

Solve.

1. Calculate the volume of the rectangular prism to the nearest hundredth.



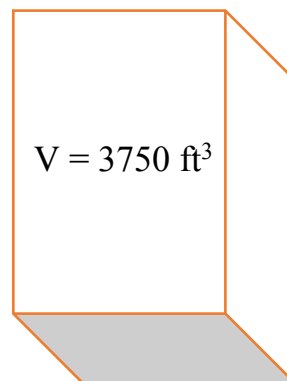
2. Calculate the volume of the rectangular prism to the nearest hundredth.



Independent Practice (PA.GM.2.3)

Name: _____

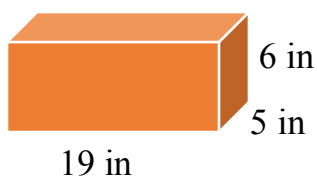
3. Find the height of the rectangular prism.



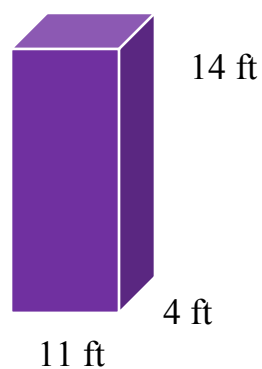
$B = 150 \text{ ft}^2$

Calculate the volume of the given rectangular prism. Round to the nearest hundredth.

4.



5.

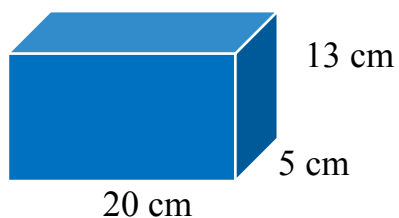


Independent Practice (PA.GM.2.3)

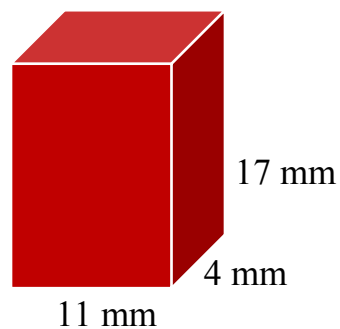
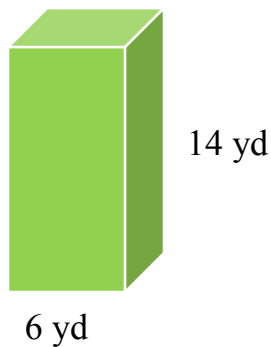
Name: _____

Calculate the volume of the given rectangular prism. Round to the nearest hundredth.

6.



7.

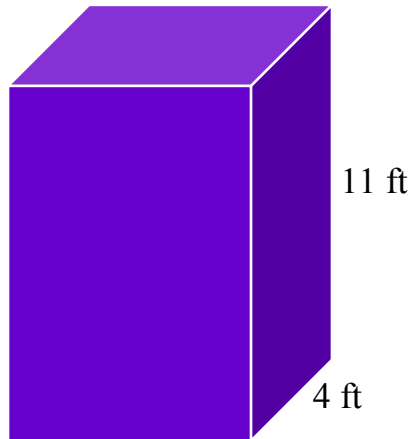
*Find the missing length. Round to the nearest hundredth.*8. Volume = 672 yd^3 9. Volume = 216 mm^3 

Independent Practice (PA.GM.2.3)

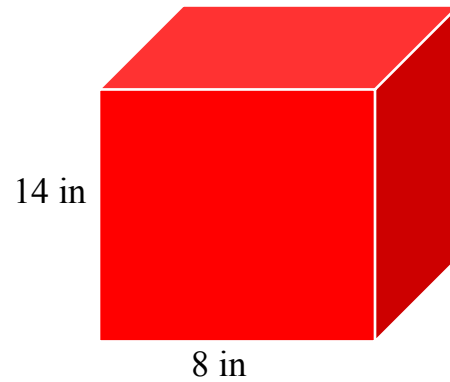
Name: _____

Find the missing length. Round to the nearest hundredth.

10. Volume = 308 ft^3



11. Volume = 448 in^3

*Solve.*

12. Calculate the volume of a rectangular prism with a length of 6.8 centimeters, a width of 3.2 centimeters, and a height of 5.6 centimeters to the nearest hundredth of a centimeter.
- _____

13. Calculate the volume of a rectangular prism with a base area of $196.875 \text{ millimeters}^2$ and a height of 16.25 millimeters to the nearest hundredth of a millimeter.
- _____

Solve.

14. Find the height of a rectangular prism with a volume of 5400 inches³ and a base area of 300 inches².

15. Find the height of a rectangular prism with a volume of 728 centimeters³ and a base area of 56 centimeters².

16. What is the capacity of a rectangular trough that is 20 meters long, 10 meters wide, and 5 meters deep?

17. The donut shop in Tulsa has purchased new boxes that are 12 inches long, 8 inches wide, and 4 inches tall. What is the volume of the new boxes?

18. The aquarium is building a new sting ray tank. They need it to have a volume of 187,500 yards³; the area they have for it is 7,500 yards², how tall will it have to be?

Independent Practice (PA.GM.2.3)

Name: _____

Solve.

19. The Oklahoma Game and Wildlife Preserve has a holding tank for largemouth bass that is 12 feet long and 5 feet wide. If it has a total volume of 240 feet^3 , how deep is it?

20. Sandy has 3 guinea pigs. Each guinea pig needs a volume of 36 inches^3 to survive. She has an area on a dresser for the cage that is 12 inches^2 . How tall will the cage have to be?

Complete the following problems.

1. $4.2 \times 10^{-3} \times 2.1 \times 10^6$

2. Is $\sqrt{144}$ a rational or irrational number?

3. Jackson's ROTC group presented the colors at the Oklahoma City Thunder Game. His parents went to watch and paid a total cost (c) of \$85.00 for their two adult tickets (a) and parking (p), which was \$15, how much was each ticket? Use $c = 2a + p$. Identify the dependent and independent variables.

4. Marcus mows lawns for extra money during the summer. He charges \$20 plus \$5 for each bag he rakes. Write a linear function to show the total he charges (c) per lawn? What does he charge for a lawn if he rakes 5 bags of grass?

5. A mechanic charges \$45 for a service call and \$23 an hour. Write a function that shows what the mechanic charges for repairs. Is this function linear?

Solve.

6. Denise solved the following problem incorrectly, identify the mistake that she made and give the correct answer.

$$12 \div 2 \cdot 3 + 6$$

$$12 \div 6 + 6$$

$$2 + 6$$

$$8$$

7. If triangle ABC has the following vertices: A(3, 1), B(3, 4), and C(-1, 4), what is the length of AC?

8. Jerry's Popcorn Company had an old box that measured 10 inches long, 2 inches wide, and 16 inches tall. He created a new box that is 8 inches long, 4 inches wide, and 12 inches tall. What is the surface area of both boxes?

9. What is the volume of both of Jerry's boxes in question 8?

10. Which box should Jerry use to sell his popcorn? Use math terminology to defend your answer.

PA.GM.2.2 Calculate the surface area of a cylinder, in terms of π and using approximations for π , using decomposition or nets. Use appropriate measurements such as cm^2 .

Real-World Connections

Have you ever made a rain stick out of a Pringles can or painted an old can? These are two examples of the real-world application for surface area of a cylinder, covering of all sides. A cylinder is a three dimensional shape, having a radius and height, made up of a pair of parallel congruent circles as bases and a rectangle that has a length equal to the circumference of the circles. The surface area is the total area of the two circles and the rectangle; however, you only need to calculate the area of one circle and double it because the top and bottom have the same area. Finally, you add that product to the product of the circumference of the circle (length of the rectangle) and the height of the cylinder.

Vocabulary

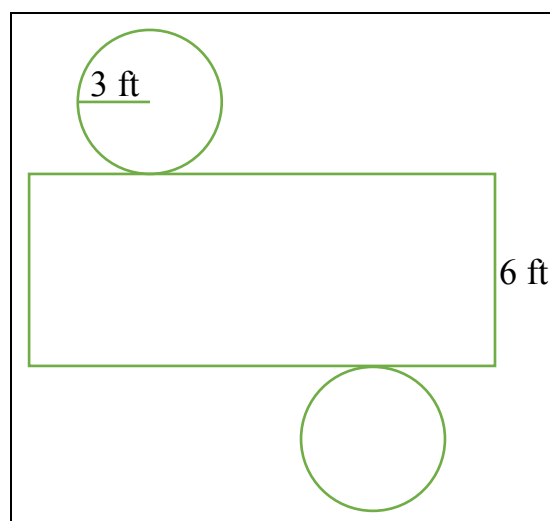
calculate	to work something out, a mathematical operation
cm^2	a cm raised to the second power which is indicated by a small 2 to its upper right
cylinder	a three-dimensional figure with two parallel congruent circles as bases and two parallel lines
decomposition	breaking apart of a three-dimensional figure into its two dimensional sides
nets	a two-dimensional representation of a three-dimensional figure constructed of polygons, such that if a fold were made on certain edges of the net and appropriate sides were “glued” together, the resulting figure would be the original three-dimensional figure
π (Pi)	irrational number that is derived by finding the constant ratio of the circumference to the diameter of a circle
surface area	total measure of the area of all sides

Complete the following problems.

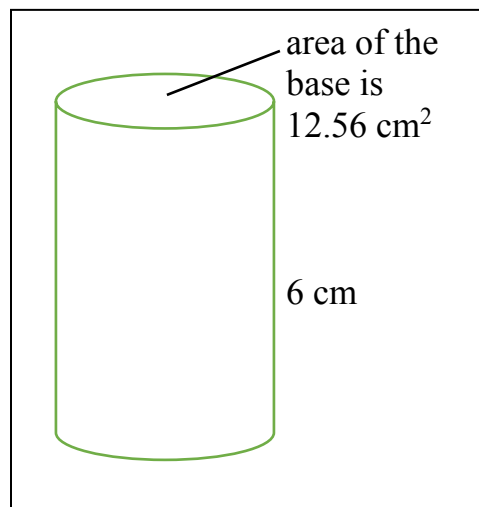
1. Which decomposition could represent a cylinder?

- A 2 circles with a radius of 4 feet and a rectangle with length of 25.12 feet
- B 2 circles with an area of $12.56 \text{ centimeters}^2$ and a rectangle with length of 25.12 centimeters
- C A circle with a radius of 4 feet and a rectangle with length of 25.12 feet
- D Circles with an area of $12.56 \text{ centimeters}^2$ and a rectangle with length of 25.12 centimeters

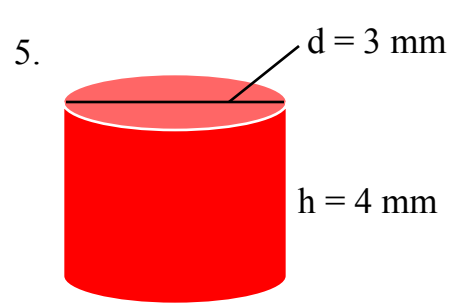
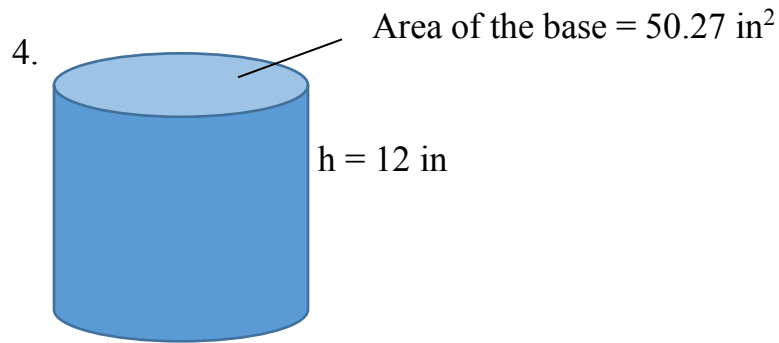
2. Calculate the surface area of the cylinder.



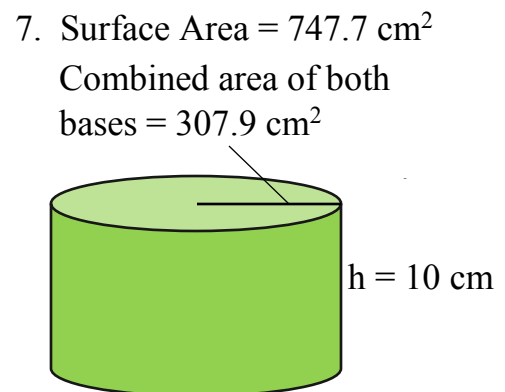
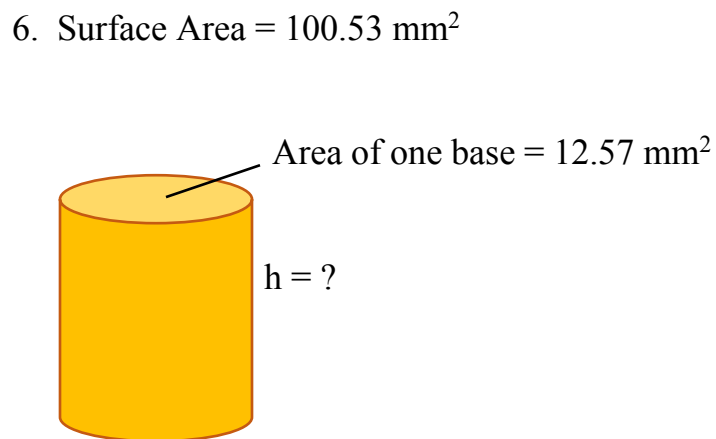
3. Calculate the surface area of the cylinder.



Calculate the surface area of the given cylinder.



Find the missing length.



Solve.

8. Calculate the surface area of a cylinder with one base area of $78.5 \text{ centimeters}^2$ and a height of 15 centimeters.

9. Calculate the surface area of cylinder with a radius of 6 inches and a height of 7 inches.

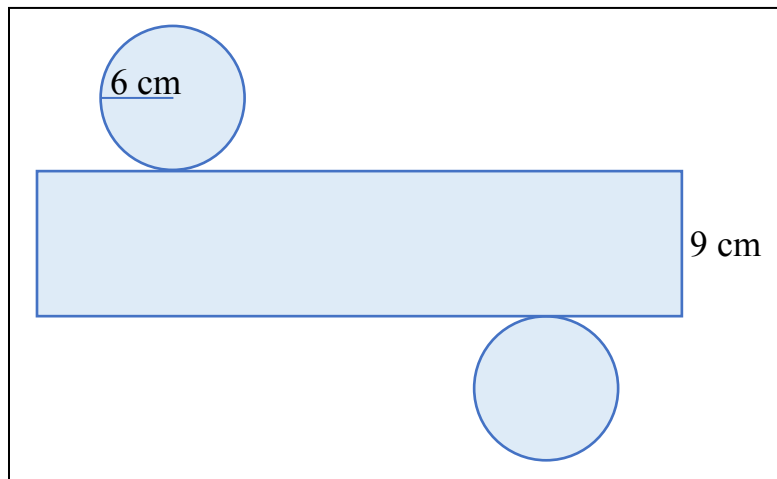
10. Charles is making a cylinder out of construction paper. The diameter of his cylinder is 6 centimeters and the height is 8 centimeters. What is the surface area of his cylinder?

PA.GM.2.2 Calculate the surface area of a cylinder, in terms of π and using approximations for π , using decomposition or nets. Use appropriate measurements such as cm^2 .

Solve.

1. Which decomposition could represent a cylinder?
 - A A circle with a radius of 3 centimeters and a rectangle with length of 18.84 centimeters.
 - B A circle with an area of 28.26 feet^2 and a rectangle with length of 9.42 feet.
 - C 2 circles with a radius of 3 centimeters and a rectangle with length of 18.84 centimeters.
 - D 2 circles with an area of 28.26 feet^2 and a rectangle with length of 9.42 feet.

2. Calculate the surface area of the cylinder.

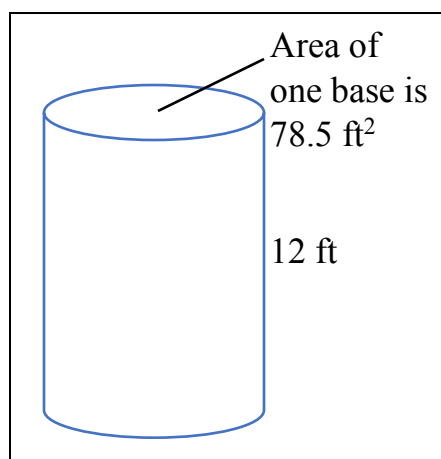


Independent Practice (PA.GM.2.2)

Name: _____

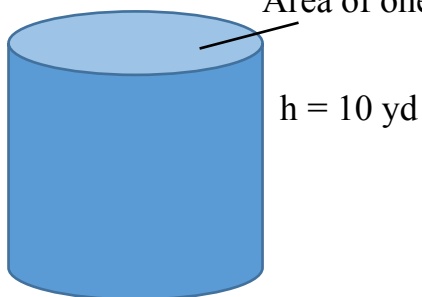
Solve.

3. Calculate the surface area of the cylinder.

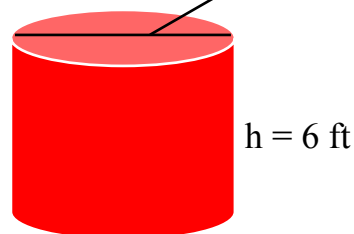


Calculate the surface area of the given cylinder.

4. Area of one base = 153.94 yd²



5. $d = 8 \text{ ft}$

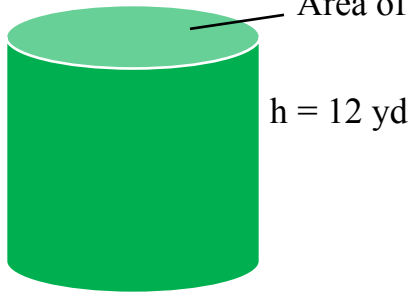


Independent Practice (PA.GM.2.2)

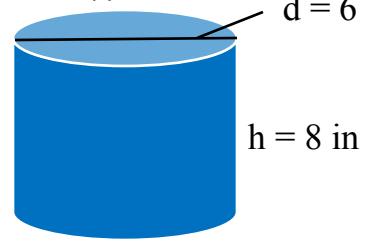
Name: _____

Calculate the surface area of the given cylinder.

6. Area of one base =
- 201.06 yd^2

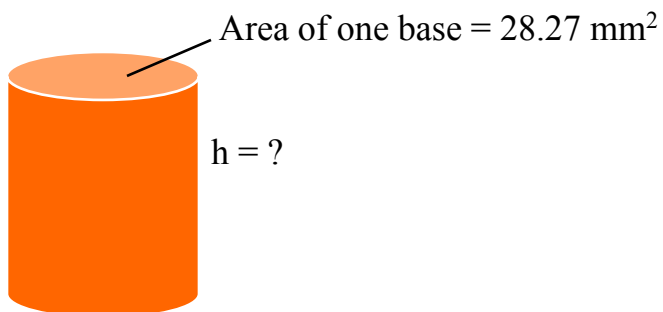


- 7.
- $d = 6 \text{ in}$

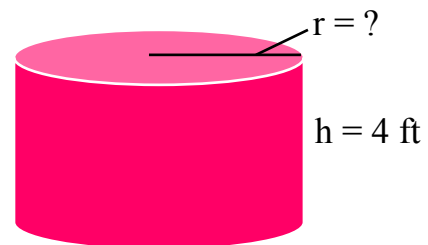


Find the missing length.

8. Surface Area =
- 207.35 mm^2



9. Surface Area =
- 131.95 ft^2
-
- Area of rectangle =
- 75.4 ft^2

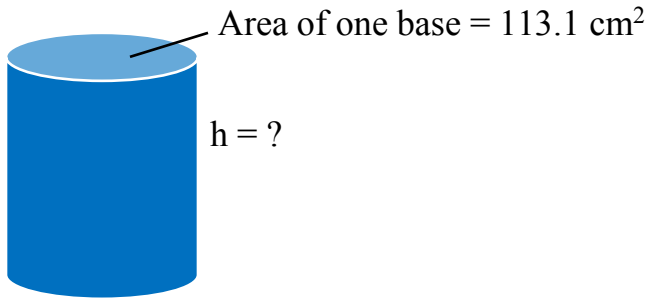


Independent Practice (PA.GM.2.2)

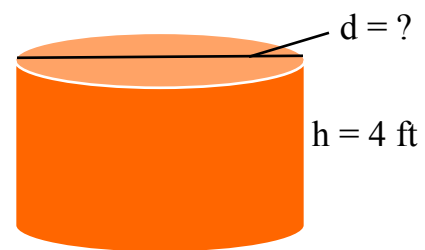
Name: _____

Find the missing length.

10. Surface Area = 527.79 cm^2



11. Surface Area = 51.84 ft^2
Area of 2 bases = 14.0 ft^2

*Solve.*

12. Calculate the surface area of the cylinder with a radius of 9 inches and a height of 15 inches.
- _____

13. Calculate the surface area of the cylinder with radius 12 millimeters and a height of 21 millimeters.
- _____

14. Calculate the surface area of cylinder that has a base with an area of 254.34 feet^2 and a height of 26 feet.
- _____

15. Calculate the surface area of cylinder that has a base with an area of $50.27 \text{ millimeters}^2$ and a height of 6 millimeters.
- _____

Solve.

16. Rhianna is repainting the cylindrical water tower next to her high school. The water tower has a radius of 8 yards and is 12 yards tall. What is the surface area of the water tower?

17. Jack is covering the sides and bottom of a Pringles can with paper. How many square inches does Jack need if the can has a radius of 2 inches and a height of 12 inches?

18. Rhonda is painting an old can to make a gift for her mother. She is painting the bottom and sides of the can. If the can has a diameter of 6 inches and a height of 9 inches, what is the surface area that she will paint?

19. The Oklahoma Zoo is building a cylindrical food storage container to hold the elephant food. They are building it on a round concrete slab with an area of 78.5 yards^2 . How much aluminum is needed for the sides and the top if it will be 30 yards tall?

20. The Oklahoma Department of Agriculture needs a new cylindrical grain elevator. They have 94,200 square feet of metal to use. If they build an elevator that is 250 feet tall with a base area of 15,708 square feet, what will the diameter of the elevator be?

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Complete the following problems.

1. Write $g \cdot g \cdot g \cdot g \cdot g \cdot g \cdot g \cdot g \cdot g \cdot g$ to one power.

2. Write 2.14×10^{-6} in standard form.

3. Place these numbers in order **LEAST** to **GREATEST**.

$$15.6 \quad 4^2 \quad \sqrt{200}$$

4. How would the line $3x + 2$ change if the slope was changed to -3?

5. Evaluate $4x - 2$ if $x = \frac{1}{2}$.

6. What is the length of the short leg on a right triangle if the hypotenuse is 12.5 inches and the long leg is 10 inches?

7. If triangle ABC has the following vertices: A(-3, 7), B(-3, 2), and C(4, 2), what is the length of AC rounded to the nearest tenth?

Complete the following problems.

8. Charles is painting a cylindrical building with a radius of 6 feet and a height of 21 feet. What is the surface area that he will paint? (He will not paint the bottom.)

9. If 1 gallon of paint covers 38 feet², how many gallons of paint would Charley need?

10. Home Depot has paint on sale. If you buy one gallon, you get the second gallon half price. The color he wants is \$12.95 per gallon. What was his subtotal before taxes?

PA.GM.2.4 Develop and use the formula $V=\pi r^2 h$ and $V=Bh$ to determine the volume of right cylinders. Justify why the base area (B) and height (h) are multiplied to find the volume of a right cylinders. Use appropriate measurements such as cm^3 .

Real-World Connections

Have you ever wondered why a Pringles container is a certain size? Companies must maximize how much volume a container will hold while using the least amount of material (surface area of a container). This will keep the cost down and allow for larger profits. Since a right cylinder has circular bases and height, you would find the area of the base and multiply that by the height. This would be like stacking the base over and over until it was the height of the prism. Mathematicians use the symbol B to represent area of the base. Since area of a circle is calculated as πr^2 the two formulas for volume of a right cylinder are $\pi r^2 h$ and Bh .

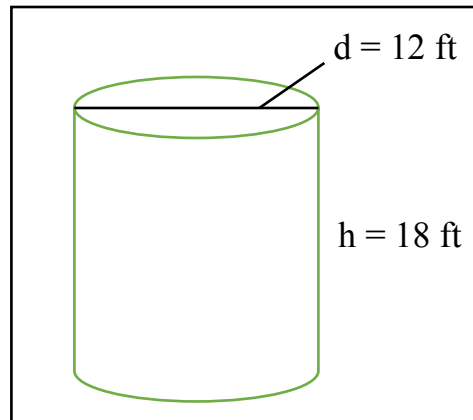
Vocabulary

base area	the area of the base
cm^3	a cm raised to the third power which is indicated by a small 3 to its upper-right
formulas	a group of mathematical symbols that express a relationship or that is used to solve a problem
height	measurement from top to bottom
$\pi(Pi)$	irrational number that is derived by finding the constant ratio of the circumference to the diameter of a circle
right cylinder	a cylinder with circular bases with axis joining the centers of the bases perpendicular to the planes of the two bases
volume	measurement of the amount of space within a closed three-dimensional shape

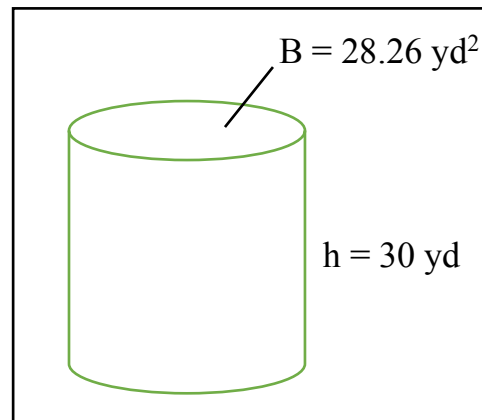
Solve.

1. Explain why both π times r^2 times height ($\pi r^2 h$) and the area of the base times height (Bh) can be used to find the volume of a right cylinder?

2. Calculate the volume of the right cylinder.

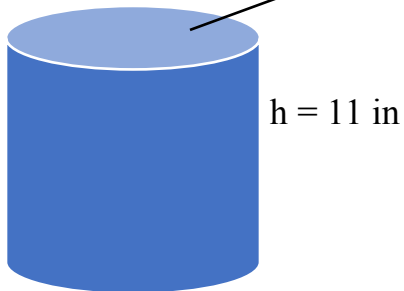


3. Calculate the volume of the right cylinder.

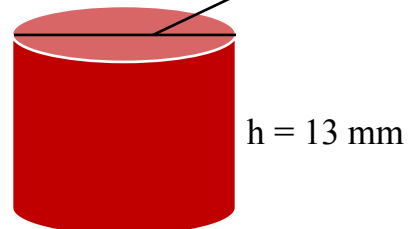


Calculate the volume of the given cylinder in terms of π .

4. Area of the base = $36\pi \text{ in}^2$



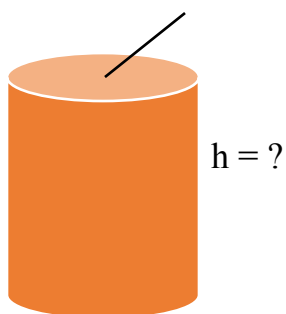
5. $d = 8 \text{ mm}$



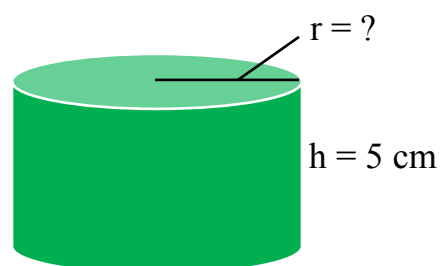
Find the missing length.

6. Volume = $225\pi \text{ mm}^3$

Area of the base = $25\pi \text{ mm}^2$



7. Volume = $45\pi \text{ cm}^3$



Solve.

8. Calculate the volume of a right cylinder with a base area of $78.5 \text{ centimeters}^2$ and a height of 11.25 centimeters to the nearest hundredth of a centimeter.

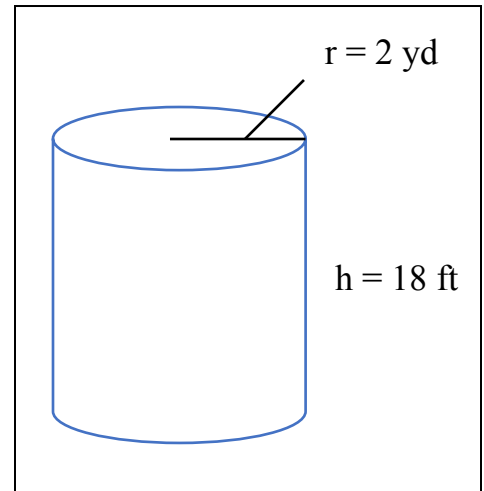
9. Calculate the volume of a right cylinder with a radius of 6 inches and a height of 21 inches.

10. A 15 centimeters long cross section of pipe has a width of 6 centimeters. Calculate the volume of the section of pipe. Round to the nearest hundredth.

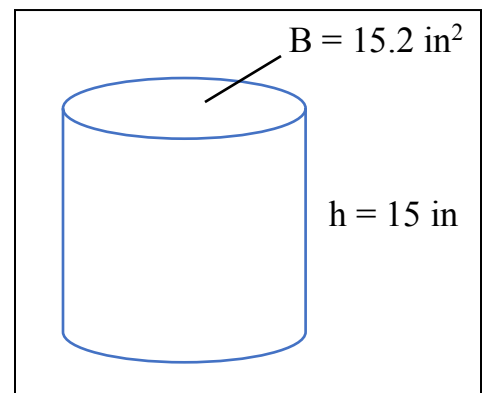
PA.GM.2.4 Develop and use the formula $V = \pi r^2 h$ and $V = Bh$ to determine the volume of right cylinders. Justify why the base area (B) and height (h) are multiplied to find the volume of a right cylinders. Use appropriate measurements such as cm^3 .

Complete the following problems.

1. Calculate the volume of the right cylinder to the nearest hundredth of a yard.



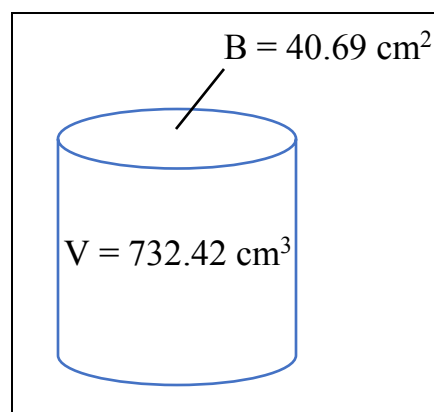
2. Calculate the volume of the right cylinder to the nearest hundredth.



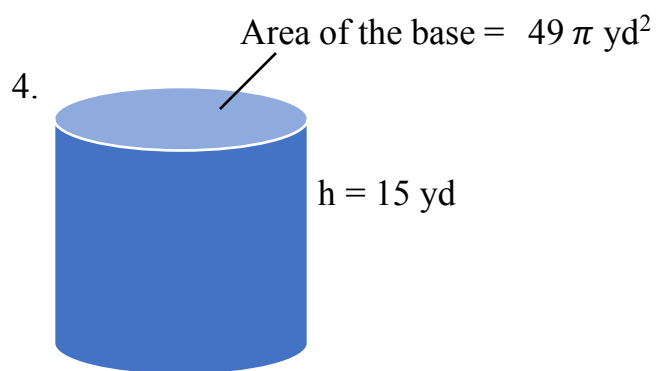
Independent Practice (PA.GM.2.4)

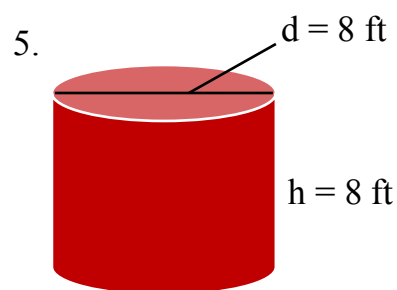
Name: _____

3. Find the height of the right cylinder.



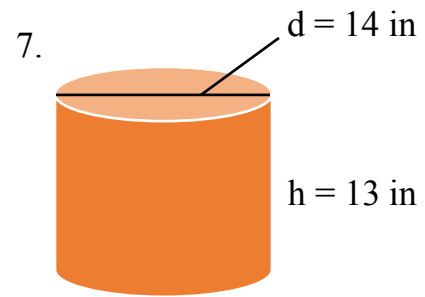
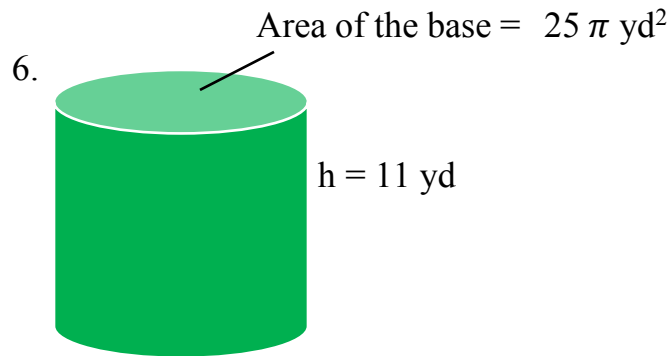
Calculate the volume of the given cylinder in terms of π .



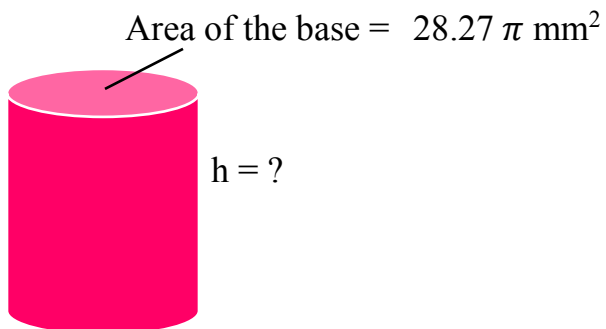


Independent Practice (PA.GM.2.4)

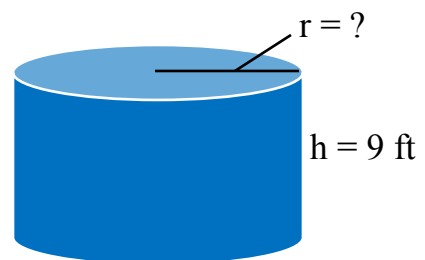
Name: _____

Calculate the volume of the given cylinder. Round to the nearest hundredth.*Find the missing length. Round to the nearest whole number.*

8. Volume = 197.92 mm^3



9. Volume = 452.16 ft^3

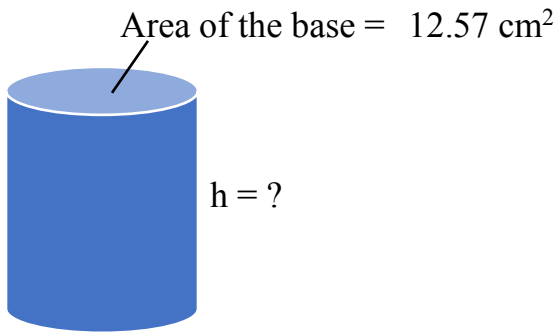


Independent Practice (PA.GM.2.4)

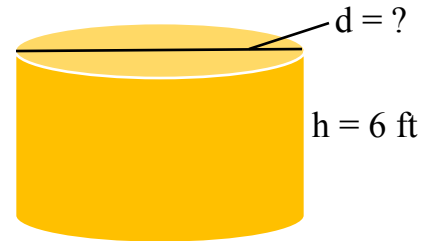
Name: _____

Find the missing length. Round to the nearest whole number.

10. Volume = 62.8 cm^3



11. Volume = 301.44 ft^3

*Solve.*

12. Calculate the volume of a right cylinder with a radius of 3.2 centimeters and a height of 5.6 centimeters to the nearest hundredth of a centimeter.
- _____

13. Calculate the volume of a right cylinder with a base area of 91.56 millimeters and a height of 16.25 millimeters to the nearest hundredth of a millimeter.
- _____

14. Find the height of a right cylinder with a volume of $12,717 \text{ inches}^3$ and a base area of 254.34 inches^2 .
- _____

15. Calculate the volume of a right cylinder with a radius of 2 inches and a height of 6 inches.
- _____

Solve.

16. What is the volume of tube that is 14 millimeters long with a radius of 4 millimeters?

17. Jenny made a rain stick with radius 4 centimeters and a height of 15 centimeters. What is the volume of the rain stick?

18. What is the volume of a rain gauge that has a diameter of 2 inches and a height of 6 inches?

19. An oatmeal box has a radius of 15 millimeters. If it has a total volume of 31,792.5 millimeters³, what is the height of the box?

20. Barry has a trash can that has a volume of 1.19 yards³ and base area of 0.79 yards². What is the height of the trash can in inches?

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Complete the following problems.

1. $4.8 \times 10^3 \div 2 \times 10^{-5} =$

2. Is 4π a rational or irrational number?

3. Mia bought 3 shirts of equal price and a pair of jeans (j) for \$34.99 on tax free weekend. The total cost (c) was \$82.84. How much did she spend on each shirt? Use $c = 3s + j$ to calculate the cost of the shirts. Identify the dependent and independent variables.

4. Jeffrey works half his brother's paper route on weekends to make spending money. His brother pays him \$10 plus \$1.50 for each paper he rolls and bags. Write a linear function to show the total he earns (p) per day? What does he make if he rolls and bags 20 newspapers?

5. A Wi-Fi company charges \$15 plus \$3 per gig of data for monthly use. Write a function that shows the company's total monthly charges. Is this function linear?

6. Donald solved the following problem incorrectly, identify the mistake that he made and give the correct answer. $16 \div 2 + 6$
- $$\begin{array}{r} 16 \div 8 \\ 2 \end{array}$$

-
7. If triangle ABC has the following vertices: A(-2, 1), B(1, -6), and C(-2, -6), what is the length of AB?

-
8. Cotton's Oil Company has an old oil container with a radius of 35 feet and height of 40. They plan to build a new oil container with a radius of 25 feet and height of 50. What is the surface area of both oil containers?

-
9. What is the volume of both oil containers in question 8?

-
10. Should the oil company build the new oil container? Use math terminology to defend your answer.
-
-

A

addition: to join two or more numbers or quantities to get one number called the sum, or total

algebraic expression: mathematical phrase combining number and variables and may include operations and grouping signs, an expression does not contain equality or inequality symbols, however both sides of an equation or inequality is an expression

approximation: the estimate a number, amount or total, often rounding it off to the nearest 10 or 100

associative property: of addition states $(a + b) + c = a + (b + c)$, of multiplication states $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ for this operation the addends or factors remain the same order, but change who they associate with first

average: a number expressing the central or typical value in a set of data, in particular- the mode, median, or most commonly the mean, which is found by dividing the sum of the values in the set by the number of values in the set

B

base: the number or variable representing the factor being multiplied

base area: the area of the base

biased: sample in which individuals, items, or data were not equally likely to have been chosen

C

calculate: to work something out, a mathematical operation

calculator: electronic device used for making mathematical calculations

central tendency: typical value for the probability distribution, the most common measures of central tendency are mean (average), median (middle data point), and mode (data point that occurs most often)

classify: arrange in categories by characteristics

cm²: a cm raised to the second power which is indicated by a small 2 to its upper right

cm³: a cm raised to the third power which is indicated by a small 3 to its upper right

coefficient: number the variable is multiplied by

commutative property: of addition states $a + b = b + a$, of multiplication states $a \cdot b = b \cdot a$, for this operation the addends or factors move around or commute

compare: show how two or more items are alike

consecutive positive numbers: positive numbers that follow one another, without gaps, from least to greatest

constant: number that does not change

contrast: show how two or more items are different

coordinate plane: plane in which a point is represented using two coordinates that determine the precise location of the point

cylinder: a three-dimensional figure with two parallel congruent circles as bases and two parallel lines

D

data: a collection of information gathered by observation, questioning, or measurements often organized in graphs or charts

data point: element in a data set

data set: separate elements of related data

decomposition: breaking apart of a three-dimensional figure into its two dimensional sides

delete: remove

dependent events: events that can only occur if something else occurs first

dependent variable/range: the set of all "output" or possible after substituting the domain or the quantity that is affected when the input or independent variable is changed

diagram: simplified drawing or sketch

distributive laws: states that $a(b + c) = (a \cdot b) + (a \cdot c)$, for this operation multiplying a number by a sum is the same as multiplying the number by each addend and then adding the products

divide: to divide, or division, is sharing or grouping into equal parts

dynamic software: software that can be used in the classroom for mathematics

E

equal: to have the same value

equations: number sentence that use the equal sign, it may or may not have mathematical operations ($1 + 2 = 3$)

equivalent algebraic expressions: two algebraic expressions are said to be equivalent if one can be obtained from the other using the properties of operations, such as commutative, associative, and distributive properties, as well as by representing numbers in the expressions in different but equivalent forms

equivalent numerical expressions: two numerical expressions are said to be equivalent if one can be obtained from the other using the properties of operations, such as commutative, associative, and distributive properties, as well as by representing numbers in the expressions in different but equivalent forms

estimate: make an approximate calculation

experimental probability: ratio of the number of times an event occurs to the total number of trials

exponent: the number or variable that indicates how many times the base is used as a factor, e.g., in $4^3 = 4 \times 4 \times 4 = 64$, the exponent 3, indicating that 4 is repeated as a factor three times

expressions: a mathematical phrase that combines operations, numbers, and/or variables

F

formulas: a group of mathematical symbols that express a relationship or that is used to solve a problem

function: a rule that assigns to every element of one set (the domain, x , input) exactly one element of another set (the range, y , output), often thought of as an "input/output" rule, as in every input determines an output (usually according to mathematical operations performed on the output)

G

graph: visual diagram used to represent statistical information or functions and equations

graphical properties: slope, x-intercept, y-intercept

H

height: measurement from top to bottom

I

independent events: events that can occur separately no matter what else occurs

independent variable: the set of "input" or argument values for which the function is defined or the quantity whose value is changed

inequalities: occur when things aren't equal, there are 4 types of inequalities: a is less than b ($a < b$), a is greater than b ($a > b$), a is less than or equal to b ($a \leq b$), or a is greater than or equal to b ($a \geq b$)

insert: add to a set

intercepts: geometrically, where a graph intersects an axis in a Cartesian plane

interpret: explain the meaning of information

irrational: cannot be expressed as a ratio of whole numbers or a decimal that is finite

L

label: term identifying the data on the axis

limited: a set number

line of best fit: straight line drawn through the center of a group of data points plotted on a scatter plot

linear: in a straight line, the exponent of the variable term (x) is a one (first power)

linear equations: equation that can be written in the form $Ax + By + C = 0$ where A and B cannot both be 0. The graph of such an equation is a line

linear function: a function (f) is linear if can be written in the form $f(x) = mx + b$

linear inequality: a linear function that contains one of four inequality symbols: less than ($<$), greater than ($>$), less than or equal to (\leq), greater than or equal to (\geq)

M

mean: measure of center in a set of numerical data, computed by adding the values in the set and dividing by the number of values in the set

measurements: use of standard units to determine size or quantity such as length, breadth, height, area, mass or weight, volume, fluid volume, capacity, temperature, and time

median: measure of center in a set of numerical data that appears at the center of the sorted data set when an odd number of values are in the set or the mean of the two center data points when the data set has an even number of values

multiplication: a mathematical operation where a number is added to itself a number of times

multiply: mathematical operation where a number is added to itself a number of times

N

natural number: number that occurs naturally, known as counting numbers, 1,2,3...

nets: a two-dimensional representation of a three-dimensional figure constructed of polygons, such that if a fold were made on certain edges of the net and appropriate sides were “glued” together, the resulting figure would be the original three-dimensional figure

number line: a line in which numbers are marked

numbers: an arithmetical value, expressed by a word, symbol, or figure, representing a quantity and used in counting and making calculations and for showing order in a series or for identification

O

order of operations: order of operations - convention adopted to perform mathematical operations in a consistent order:

1. perform all operations inside grouping symbols and/or above and below a fraction bar in the order of Steps 2, 3, and 4
2. find the value of any powers or roots
3. multiply, including division from left to right; add, including subtraction, from left to right

origin: point where the x and y axes meet, $(0, 0)$

outlier: data point that is far outside a representative range of the data set

P

perfect square: a number that is a whole number when squared, that is, a number that can be expressed as n^2 for n a whole number

perfect square root: a square root that is a whole number

π (Pi): irrational number that is derived by finding the constant ratio of the circumference to the diameter of a circle

point: defined position in space, represented by an ordered pair (x, y) in a coordinate plane

population: whole set of individuals, items, or data from which a statistical sample is drawn

prediction: what is believed to be most likely based on data

properties of operations: rules that set down particular properties in relation to operations on numbers

proportional relationship: relationship in which two quantities vary directly with one another, such that if one item is doubled the other is doubled, also known as a direct variation, the equation for a linear function of such a relationship is $y = mx$ and the graph produced crosses through the origin $(0, 0)$, in this equation, m is the slope of the line, also known as the unit rate, the rate of change, or the constant of proportionality of the function

Pythagorean Theorem: for any right triangle, the sum of the square of the lengths of the legs equals the square of the length of the hypotenuse

R

random: without any order or pattern

rate of change: ratio between the change in the dependent variable relative to the corresponding change in the independent variable

rational: expressed as a ratio of whole numbers or a decimal that is finite

rational number system: consists of rational numbers, integers, whole numbers, and natural numbers

rational numbers: number expressible in the form a/b or $-a/b$, a and b are both whole numbers

real number system: set of numbers consisting of all rational and irrational numbers

rectangular prism: a three-dimensional object constructed from three pairs of parallel congruent rectangles (called faces) that share common edges and form an enclosed space

right cylinder: a cylinder with circular bases with axis joining the centers of the bases perpendicular to the planes of the two bases

right triangle: three-sided shape that has one right angle, 90°

S

sample: subset of individuals, items, or data drawn from a population to make statistical conclusions of the population

scatterplot: graph in the coordinate plane representing data from two variables

scientific notation: a widely-used floating point system in which numbers are expressed as products consisting of a number between 1 and 10 multiplied by an appropriate power of 10

slope: measure of the steepness of a line in a Cartesian plane, found by determining the constant rate of change in the y-coordinate per 1-unit change in the x-coordinate, $\Delta x/\Delta y$, $(y_2 - y_1)/(x_2 - x_1)$, when in standard form it is $(-A)/B$. when in slope-intercept form it is m

solution: value that makes an equation or inequality true

spreadsheet: displays a table of data points displayed in cells and arranged in column and rows

square root: number when multiplied by itself gives the original number ■ symbol $\sqrt{}$

standard notation: the normal way of writing numbers

straight line: a line with no bends or curves, shortest distance between two points

substitution: the exchange of two or more items, such as a given value for a variable

surface area: total measure of the area of the faces of a prism; or the area of all sides

symbol: commonly used to represent values, equality, operations, grouping, and mathematical terms

T

table: mathematical information organized in columns and rows

three dimensional: having length, width or breadth, and height

title: term that defines what the graphic, in this case scatterplot, is representing

two dimensional: having length and width or breadth

V

variable: letter or symbol that represents a quantity that can change or that may take on different values

volume: measurement of the amount of space within a closed three-dimensional shape

X

x-axis: horizontal axis in the Cartesian plane

x-intercept: where the line crosses the x -axis, $y = 0$, when in standard form it is C/A

Y

y-axis: vertical axis in the Cartesian plane

y-intercept: where the line crosses the y -axis, $x = 0$, when in standard form it is C/B , when in slope-intercept form it is b

Z

zero: the number 0, sometimes used as a place holder, nothing, none, nil, naught

π (Pi): irrational number that is derived by finding the constant ratio of the circumference to the diameter of a circle

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